APRIL 1955

plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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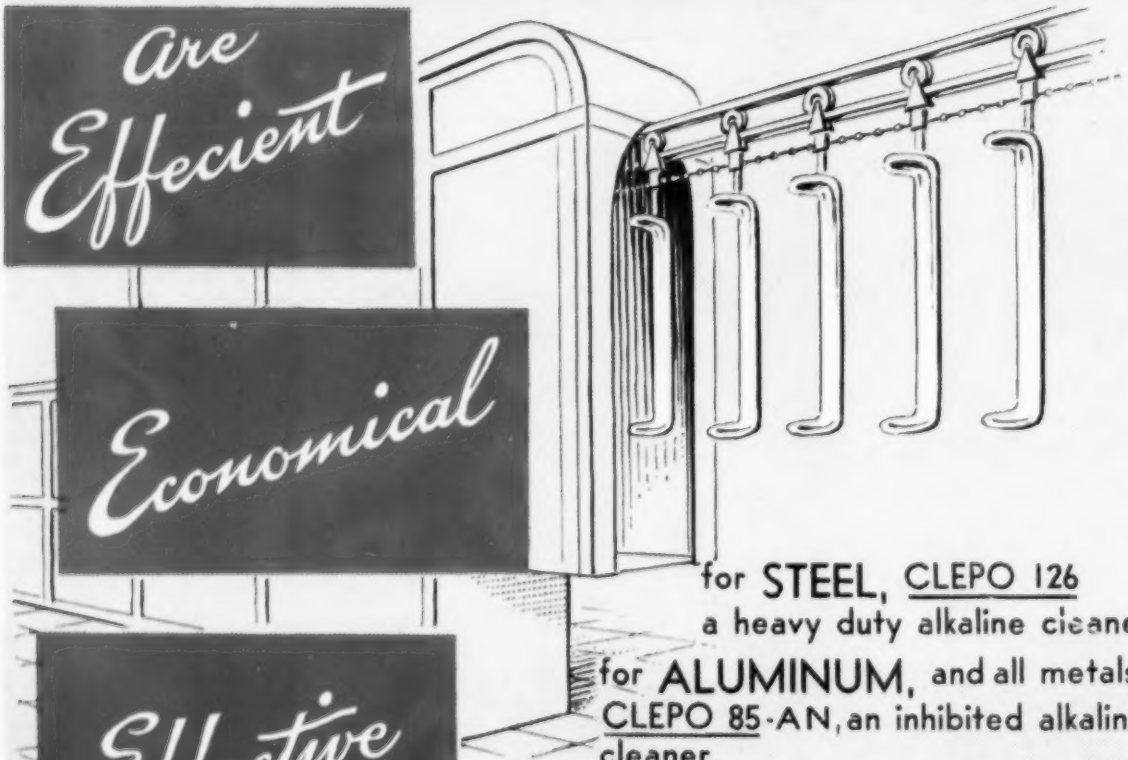

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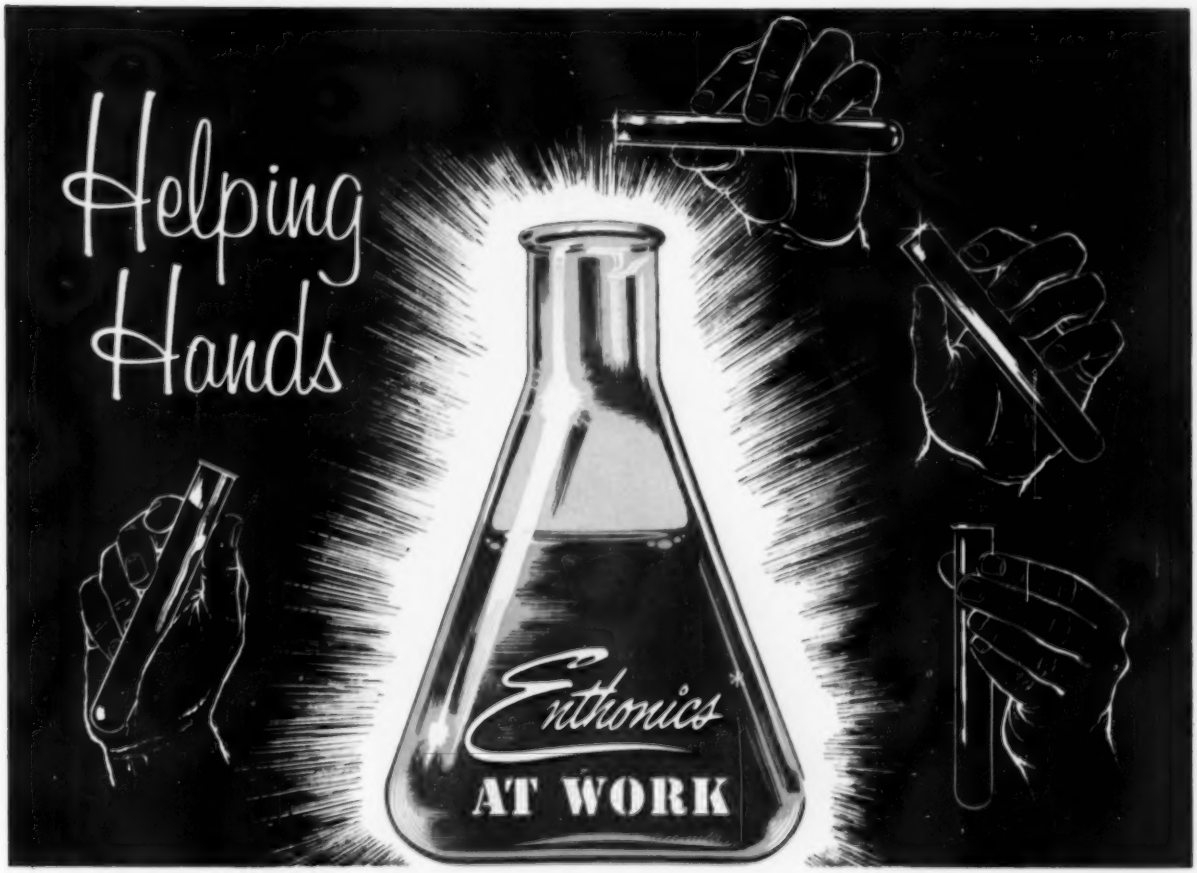

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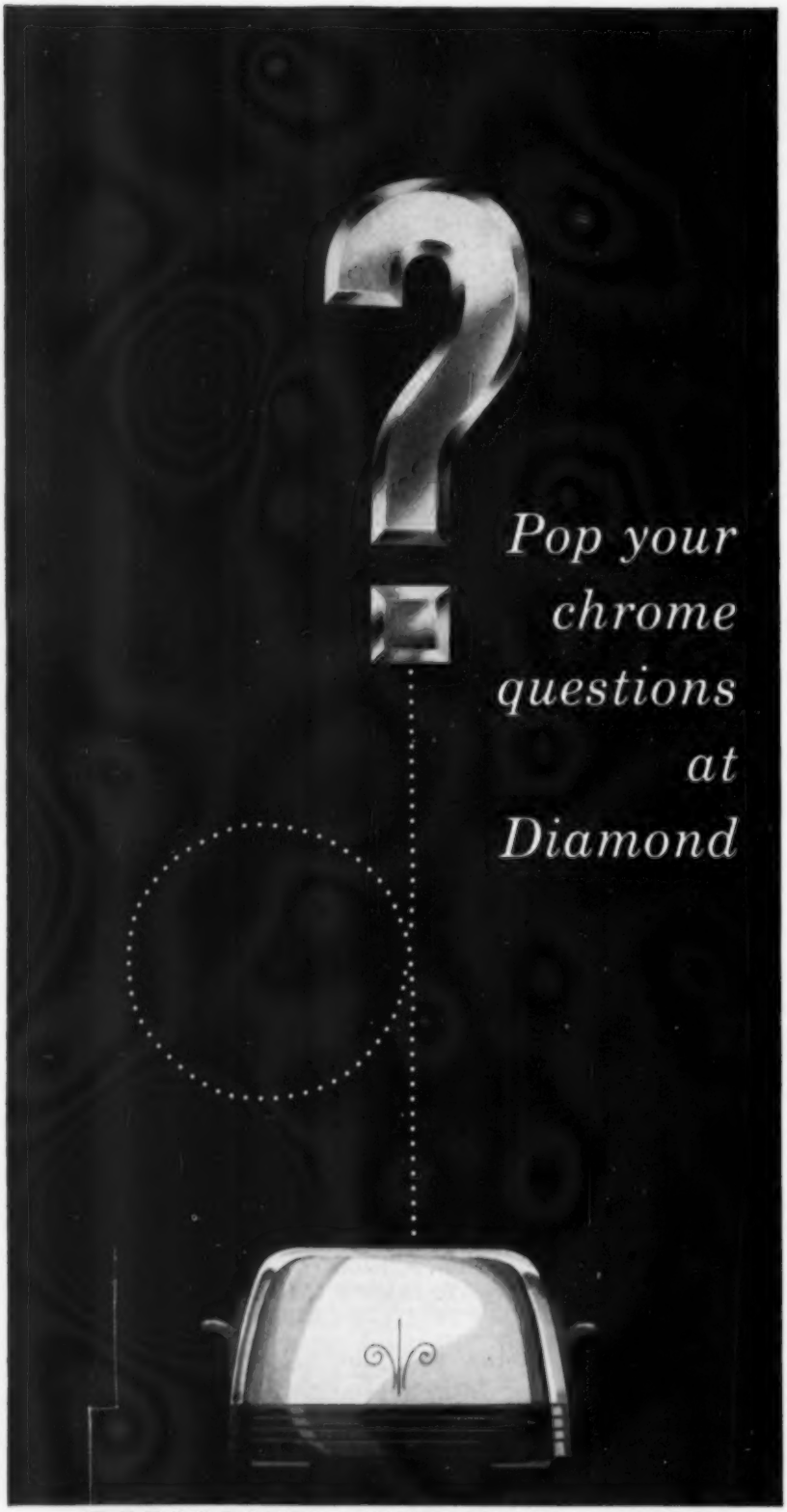

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plating

Journal of the American Electroplaters' Society

April 1955 **Vol. 42, No. 4**

Dedicated to the improvement and dissemination of the knowledge of the arts and sciences of electroplating and of finishing of metals and of allied arts

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Editorial

SCIENCE and ACTION

IT IS a part of the nature of our modern world to require action. Everything in our world is cumulative and active. All of our science and culture depend upon *use*, active participation, or action as such. All the scientists in the world could not bring one cent of betterment or wealth to our society were it not for the men who use and actively interpret their scientific findings.

The practical man, the producer, is effectively the man of today. Thanks to him the myriad and complicated conclusions reached in the laboratories can become a part of the wealth and progress of the nation and society in general.

Scientific fact, in use, becomes a part of the user. It becomes the ordinary everyday occurrence in time. It becomes the expected, the pedestrian matter, the instrument of accomplishment. This conversion of an object of study into an instrument is accomplished by none but the practical man, the producer, the user of the fact. As an instrument it becomes a part of the user in the sense that a pencil becomes a part of the writer, as clothes become a part of the wearer.

It is therefore important that we keep in mind always the heroic role played by the practical man, the manufacturer, the "ordinary" user of scientific fact. It is a prime consideration to remind the reader that without the practical man modern science with its vast body of fact and theory is but the land of dilettanti. It becomes a simple area of hobbyists—without that vast army of practical men who take up the findings of scientists and translate them from the minutiae of the laboratory into the quantitative and qualitative products of industry.

Thus science, mixed with action, becomes the enricher of all mankind. Thus do we of this publication strive to achieve some balance between the "long-hair" scientist and the "pedestrian" producer.

The Editor

AIR ARM DIVISION Westinghouse BOOSTS PLATING OUTPUT—HOLDS REJECTIONS TO VIRTUALLY ZERO

Powers Controls on Westinghouse Money Line for Copper, Silver or Gold Plating. Each Plating Tank Has Its Own Rectifier. Tanks and Electrical Equipment by H-VW-M.

Self-Operating Controls on Aluminum Cleaning Line.

uses

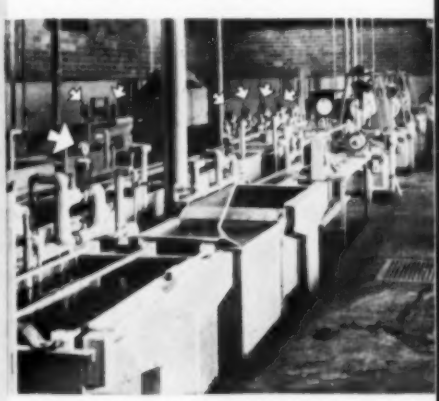
POWERS TEMPERATURE CONTROLS *to help maintain stiff standards!*

The Air Arm Division of Westinghouse utilizes time study to boost production, standardize methods, train employees, and keep costs competitive. In this new Baltimore plating plant, production *stays* high.

Hundreds of odd shapes are plated in small lots — any of 16 ways. These electronic parts may be aluminum, magnesium or steel. And Powers Self-Operating Temperature Controls help maintain exceptional plating quality. Rejections are virtually zero.

Your plating operation can profit from the use of Powers Temperature Controls. Contact the Powers office nearest you, or write us direct.

Controls on Dual Anodizing Line (left) and Magnesium Cleaning Line.



Tin, Cadmium and Zinc Barrel Plating Lines with Powers Controls.

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A SPECIAL REPORT ON PROTECTIVE FINISHES FOR ALUMINUM

Most aluminum producers and fabricators are well aware of the superiority of chemical finishes over anodizing for the protection of aluminum from corrosion. Naturally, then, there is a running battle for acceptance among the leading producers of the protective chemical finishes.

That's why, here at Allied, we have always studied your needs with regard to both our own and competitive processes. We're constantly trying to produce new and better finishes because we believe there's always room for improvement . . . even to our own products. Some years ago this policy led to the introduction of a process, long in development, that offered you a way to overcome anodizing's obvious technical complications . . . Iridite #14. This finish was far easier to use than anodizing, yet provided comparable, if not superior, quality. And, its cost was much less than anodizing.

But other finishes offering similar advantages over anodizing have entered the market. So . . . the current battle for acceptance. By any cost comparison Iridite #14 is the most economical. However, corrosion tests by users show contradictory results as to performance from Iridite #14 and other leading protective finishes for aluminum. Most tests show Iridite #14 superior, but some do not. The margin of difference, however, is always small. The truth is that all have proved good. However, our laboratory research indicated that still further improvements could be made.

That knowledge . . . plus our aim to give you even better protection and maintain the leadership of the industry, is exactly why Allied Development Engineers have been working for long years to develop a better finish than any of those now available, including our own Iridite #14.

Now the new finish is ready for you. It's called Iridite #14-2 (Al-Coat).

From a performance standpoint, Iridite #14-2 gives you two important advantages in the protective finishing of aluminum.

FIRST: in its fully colored brown film stage it provides corrosion resistance decidedly superior to previous processes.

SECOND: the basic brown film can be hot water bleached to produce a clear-type film with protection heretofore unobtainable from clear-type chemical finishes.

From an operating standpoint, new Iridite #14-2 gives you three important advantages.

FIRST: it provides consistently higher corrosion resistance for different aluminum alloys treated in the same bath.

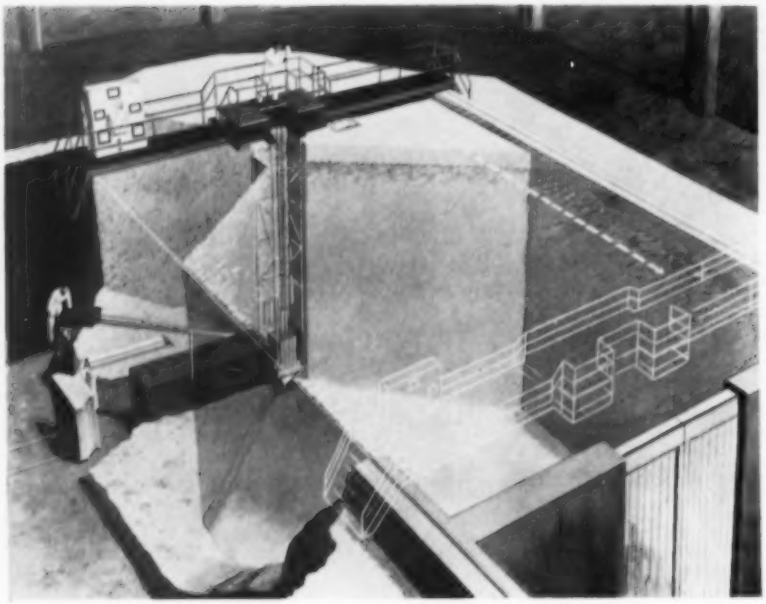
SECOND: it provides a more uniform appearance for parts of different alloys and with varied surface finishes before treatment.

THIRD: its operating and technical characteristics are superior to those of other processes.

If you are using or planning to use a chemical finish for aluminum, you should have full details on new Iridite #14-2. Write us or send samples for free test processing. Or, for more immediate advice, call your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book. - - - ALLIED RESEARCH PRODUCTS, INC., 4004-06 EAST MONUMENT STREET, BALTIMORE 5, MARYLAND.

P. S. Even new Iridite #14-2 will be constantly measured against both your needs and competitive processes to make sure you get the best possible, most economical finish for your product that man and the laboratory can develop.

Industry News



The first Nuclear Research Reactor to be owned and operated by private industrial concerns, as seen in an artist's "cutaway" conception. This "swimming pool" type reactor employs American Machine & Foundry Company's unitized design to provide flexibility for undertaking a wide variety of research and development work

Heart of the electronic system which controls operation of the world's largest bumper plating facility at Chevrolet's new Livonia Spring and Bumper Plant is a series of upright illuminated panels like the one above. There is a control panel like this for each of the three automatic lines. A total of 710 miles of wiring connects points on the control panels to some 25,000 electrically actuated parts of the plating machines. Simply by using a test probe on the panel, as above, an electrician can check on the operation of any one of these 25,000 parts

Gains in Science for 1954 Noted by GE Research Director. Demonstration by GE scientists of a direct light amplifier was a fitting climax for a year designated as "Light's Diamond Jubilee," Dr. C. Guy Suits, vice-president and director of research for General Electric, said last night in a radio talk reviewing scientific progress during 1954.

Commenting that while almost all the formidable geographic peaks of the world have now been scaled, Dr. Suits said that science still offers range after range of rugged and uncharted mountains to challenge the ingenuity of researchers.

"New methods of generating and controlling light are among the most important of these frontiers," he said, calling special attention to the new light amplifier, a device that enhances the optical image on a screen by applying energy to the screen itself rather than by modifying the projection equipment.

Increased Use of Copper Predicted. A sharp increase of 15 per cent in the use of copper was predicted today by J. B. Cottell, President of the Continental Electric Equipment Company, Cincinnati, Ohio, one of the nation's leading manufacturers and designers of electrical distribution equipment.

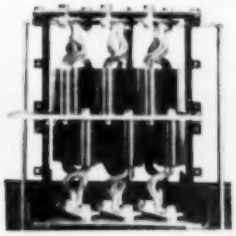
Cottell attributed the electrical industry's increased utilization of copper to the expansion of new installations of electrical distribution equipment along with the rehabilitation of equipment during the forthcoming year.

"Today," Cottell pointed out, "American industry is doubling and tripling its consumption of electrical power. Yet, the number of companies that are operating with outmoded power distribution equipment is enormous. These companies will require—and not in the distant future—replacement and rehabilitation of their electrical facilities.

"With all this equipment in the offing, the consumption of copper along with other metals will be sharply expanded."

Haskel Distributes Parker Hydraulic Equipment. Parker Appliance Company, Cleveland, Ohio, recently named Haskel Engineering Supply Company exclusive distributor in the State of California for hydraulic equipment.

Ralph Moss, vice-president of Haskel Engineering, states they will handle Parker's line of hydraulic multiple unit control valves to be used on trucks, tractors, and other mobile equipment. In addition, they will handle a line of 1½ in, 4 in, and 7 in diameter 3,000 psi cylindrical accumulators suitable for use in all types of hydraulic systems, such as test benches and power units. The inclusion of a line of 2,000 psi machine tool valves offers Haskel an opportunity to sell to the varied segments of industry.



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THE *NEWEST* AND THE *ULTIMATE* IN PLATING POWER

In keeping with our policy of continually supplying the plating industry with the ultimate in D.C. Plating Power, our research department has developed a series of GERMANIUM RECTIFIERS — what we believe to be the ultimate in Plating Power.

EFFICIENCY — 95% at full load.

VOLTAGE STABILIZATION — ± 1 volt from no load to full load.

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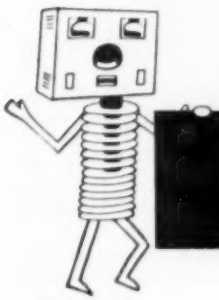
SEALED UNIT — corrosion is kept out

LONG-LIVED — no aging or change in characteristics even after accelerated full load tests.

RAPID GERMANIUM RECTIFIERS are the power supplies of tomorrow—here today. Write for full details to Rapid Electric Co., 2881 Middletown Road, New York 61, N. Y. Ask for Bulletin G-2



THE NAME THAT MEANS *"More Power to You!"*

RAPID ELECTRIC COMPANY

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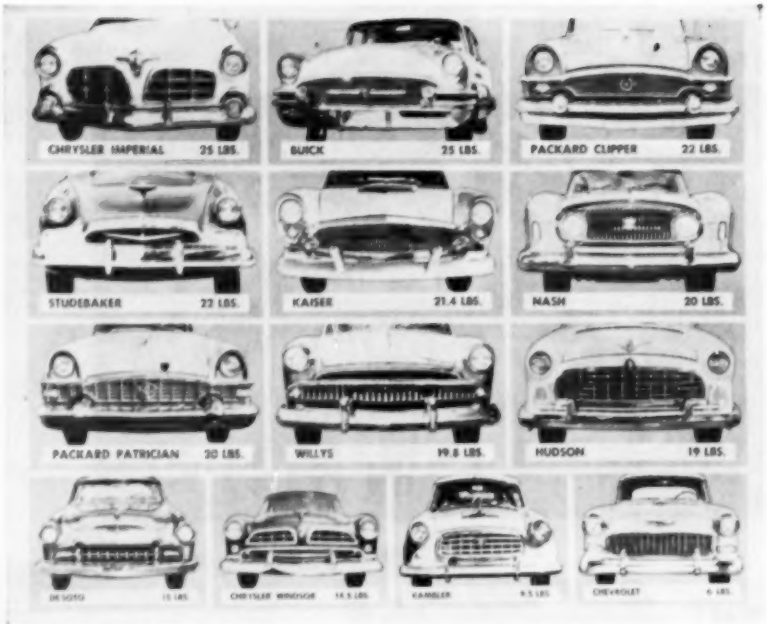
Industry News

Federated Metals Forms Aluminum Department. Keeping pace with the dynamic growth of aluminum in industry, Federated Metals Division, American Smelting and Refining Company, New York, has established a national Aluminum Department, according to E. L. Newhouse, Jr., vice-president. This important organizational change unifies Federated's nationwide aluminum operations, affording aluminum alloy consumers the advantage of maximum service from a major supplier. Also, the move facilitates the Division's program for establishing a degree of marketing and product uniformity aimed at improving continuity and reliability of aluminum supplies and technical assistance.

Packaging Exposition. Some 36,000 business executives from all parts of the United States and a number of foreign countries are expected to attend the American Management Association's 24th National Packaging Exposition, market place of the $10-billion-a-year packaging industry.

This spring's show, to be held April 18–21 in the New Exposition Hall and the South Hall of Chicago's International Amphitheatre, will set records for attendance, area, and number of exhibitors, spokesmen for the A. M. A. predicted. With the show still nearly four months away, more than 330 exhibitors already have reserved more floor space than the total area occupied by last year's record-breaking exposition.



A study just completed by American Zinc Institute reveals that 62 per cent of the 1955 autos make use of zinc die-cast grilles. Weights are indicated following the model designation below each grille. Zinc die castings used in the Chevrolet grille are the upper, lower and two vertical moldings which make up the grille frame. The 25 pounds in the Imperial and 14.5 each in the Windsor and New Yorker (not shown) constitute a major redesign for Chrysler which used no zinc in its 1954 grilles

NEW SUSTAINING MEMBERSHIPS

Four more organizations have joined the AES Research Sustaining Membership program. The new members are:

Line Material Company
South Milwaukee, Wis.

Pan-Ormond Corporation
Ormond Beach, Florida

Racine Plating Co., Inc.
Racine, Wis.

Bomac Electrotype Co., Ltd.
Toronto, Ontario, Canada

Price Rise. International Rectifier Corporation of El Segundo, Calif., the largest supplier of selenium power rectifiers, has announced that they are increasing their prices on selenium rectifiers by 5 to 10 per cent.

This increase is necessary due to an increase of 20 per cent in the price of selenium. Moreover, the cost of other materials, such as brass, copper and aluminum, has been increased during the last month. Materials such as selenium, copper, brass and aluminum are the major components necessary in the fabrication of selenium rectifier cells.

Earlier price increases in materials during 1954 have previously been absorbed

CrO_3

In deciding upon the brand of Chromic Acid to use, successful platers consider three factors:

1 — *Purity of the product as indicated by the assay and maximum limits of impurities.*

2 — *Experience and technical competence of the producer.*

3 — *Reliability of the manufacturer as demonstrated during periods of shortage.*

More Mutual Chromic Acid is used than any other brand because the metal finishing industry has found Mutual's record to be outstanding on all three counts.

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HONITE Barrel Finishing Produces

Superfine Sanitary Finish!

Cherry-Burrell Corporation, Milwaukee Division, made large savings when they switched to the HONITE Barrel Finishing Method, *and* actually improved the sanitary finish necessary on their line of food processing equipment.

The milk filler tank shown below was formerly finished in two hand operations—grinding to remove weld splatter and generally improve the surface, and polishing to bring the surface down to 15 R.M.S. Recently, Methods Engineer, Ralph Wenger, supervised a change to the HONITE Barrel Finishing Method.

Results? The recommended HONITE procedure eliminated the polishing operation completely, and 60% of the rough grinding hand operation. Finishing time was cut 1½ hours . . . and finishes were improved to a superfine finish.

Your HONITE Methods Engineer or nearby HONITE distributor will show you how *you* can increase production and cut costs, too. Call him today!

Remember, too, the HONITE Division of the 3M Company supplies a *complete line* of abrasive chips, compounds and equipment for every barrel finishing need.

CHERRY-BURRELL METHODS ENGINEER, Ralph Wenger, holds a 40 lb. stainless steel milk filler tank. HONITE Barrel Finishing Method produced its superfine finish.

Honite BRAND

IT'S NEW!

MINNESOTA MINING AND MFG. CO.
DEPT. P-45, ST. PAUL 6, MINN.

☐ *Send me FREE copy of "Facts and Figures Report on HONITE Barrel Finishing"*

☐ *I'd like to talk with a HONITE Field Engineer*

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Company .....

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City ..... *Zone* ... *State* .....

Type of product to be finished .....

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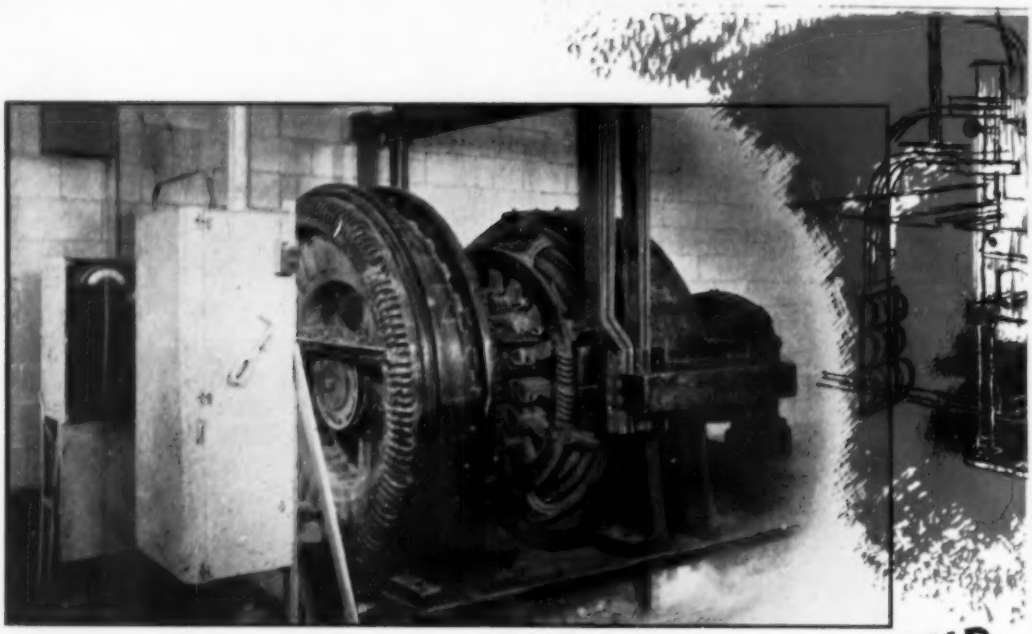
Industry leaders choose Chandeysson

ELECTROLYTIC GENERATORS

EXAMPLE: 'ROUND-THE-CLOCK
AT DiSALLE PLATING



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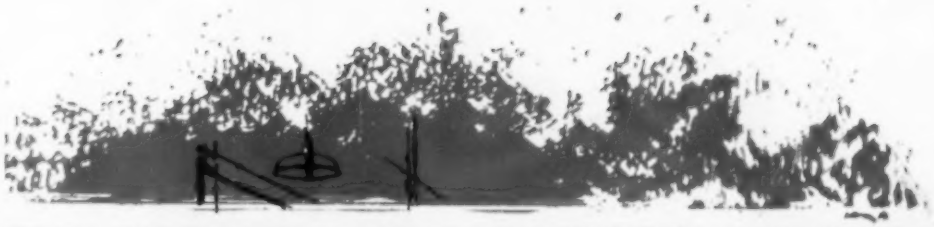

PLATING MACHINE OPERATION

CO., TOLEDO, OHIO

The 10,000-ampere, 12-volt Chandeysson Motor Generator at DiSalle Plating furnishes dependable power for 24-hour automatic plating operation. President of the firm, A. C. DiSalle, reports that his Chandeysson has practically eliminated downtime, making possible the plating of the maximum number of parts during a 24-hour period.

USE LESS POWER
precision-built for efficiency and built-in voltage regulation.

GET MORE OUT OF THE POWER YOU PAY FOR . . .
built-in high power factor at no extra cost.

BE SURE OF POWER WHEN YOU NEED IT MOST . . .
overload capacity as great as 50% momentarily and 25% sustained, without distress or damage.

ENJOY LIFETIME POWER DIVIDENDS . . .
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CHANDEYSSON ELECTRIC COMPANY
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City..... *Zone*..... *State*.....

CHA-47

Industry News

by International Rectifier Corp. However, the recent increases necessitate a price increase in their products.

American Potash Move. The New York offices of American Potash & Chemical Corporation have been moved to new quarters at 99 Park Ave., according to an announcement from company headquarters in Los Angeles.

Previously the company maintained offices for more than 11 years in the Chanin Building at 122 East 42nd St.

Reason for the move was given as increased operations and staff additions as a result of American Potash & Chemical Corporation's current expansion program.

New Chemicals Pickup Points. Phelps Dodge Refining Corporation, New York, has opened a warehouse in Chicago where sticks of all grades of Triangle Brand Copper Sulphate and Nickel Sulphate will be available for truck pickup. This will be Phelps Dodge's third shipping point, the other two being El Paso, Texas and Laurel Hill, Long Island.

The address of the new warehouse is 5310 West 66th St., Chicago 38, Ill. The Chicago sales office of the company has been moved from 230 North Michigan Blvd. to the new warehouse.

The simplicity of construction with aluminum wall and window panels is demonstrated by Brown & Grist, Inc., in erecting their new building at Warwick, Va. The building, which occupies 30,000 square feet of floor space, has among its panels several of experimental design which will furnish the manufacturers with data on their durability and resistance to exposure. Brown & Grist, which started as an $8,000-a-year business on the Lower Virginia Peninsula 10 years ago when its founders, Roy Brown and Arthur Grist, were laid off from a nearby shipyard, now grosses more than $1,000,000 annually. The concern manufactures aluminum wall panels and balanced-vent, awning-type windows. Its subsidiary, Technical Services, Inc., makes precision parts for secret aeronautical devices

Major Detroit Tool and Die Facility Acquired by Lunn Laminates. Ueber Tool and Manufacturing Co., Detroit, Mich., one of the most prominent tool and die organizations in Detroit, Mich., has been acquired by Lunn Laminates. This statement was issued to stockholders by James S. Lunn upon completion of negotiations recently.

The purchase of this modern facility

For your better satisfaction . . .

Storts attention to all details in your plating tanks makes the difference between what is best and what will do. You benefit by better production from equipment that is specifically planned for your purpose.

Typical details are these exhaust casing units for an order of Stortswelded tanks. Let Storts help you to design casings for easy maintenance and long life.

42 STONE STREET — STORTS WELDING COMPANY INCORPORATED — MERIDEN, CONN.

Manufacturers of Welded Fabrications to Specification

Industry News

marks the entry of the Lunn Corporation into the tool and die industry as a major step in a previously announced expansion program. Ueber Tool and Manufacturing Co. will operate as a wholly owned subsidiary. The 55,000 sq ft plant will be under the direction of Mr. Kurt Petrasch, general works manager. Mr. Petrasch joins Lunn Laminates, with more than 30 years of experience in the tool and die industry. Previously he has been associated with Fisher Body Division, General Motors Corporation.

Company Holds Instrumentation Orientation Course. A one-week industrial instrumentation course given free of charge periodically by Fischer & Porter Company at the Hatboro, Pa., plant has been completed by a group of nine technicians from various industries. The group came from the chemical, instrument, and research industries, located in seven northeastern and middle-western states.

The course includes a general orientation of the application of instrumentation to industry, the theory and calibration of the variable-area flow meter, and the design, nomenclature, function, and maintenance of industrial control instrumentation. A plant tour familiarized students with every phase of instrument manufacturing.

Automatic Education with Poster-Slides—"Production problems are attitude problems," is the underlying theme of the industrial education programs currently being presented to employees by the Poster Slide Company, Chicago.

Automatic Education

Analysis of production costs, accident records, tool breakage reports, machine downtime, absenteeism, and similar factors which increase production costs, has shown that to a very large degree those hindrances to productivity and profit are traceable to employee job-attitudes and supervisory work-habits.

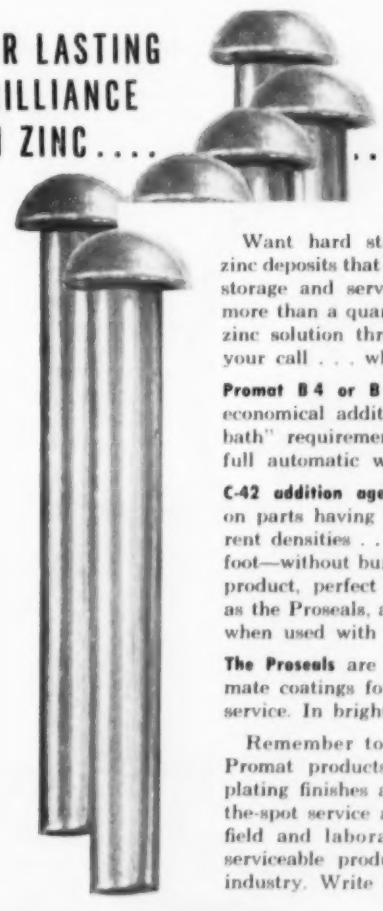
To reinforce the efforts of the supervisory organization in developing productive employee attitudes and reducing manufacturing costs and accidents, the Poster Slide Company in 1954 developed an entirely new medium of employee education: safety and productivity impact posters on full natural color 2 x 2 Kodachrome slides.

These impact poster slides are projected from behind a special translucent plastic screen in the Admatic Automatic Slide Projector, which has been used in sales displays, promotional and educational activities in industry in thousands of installations since 1946.

Edmund Mottershead, president of Mottershead Associates, consultants in industrial relations and employee communication, and nationally-known author and speaker on industrial relations problems, has headed up a team of artists and creative people who designed the posters, developed slogans and copy, and created the poster-slide program called Automatic Education.

Payroll Record Form. Simplified, time-saving payroll record forms designed to enable bookkeepers and accountants to meet pressing weekly deadlines are now being marketed by the Accounting Records Supply Company of Hollis, N. Y. The form, including individual employee's

FOR LASTING BRILLIANCE ON ZINC....



B 4 • B 4M .....and C-42

Want hard striking, durable, fine grained zinc deposits that will withstand tough handling, storage and service? Experience in operating more than a quarter million gallons of cyanide zinc solution throughout the free world is at your call . . . when you call PROMAT.

Promat B 4 or B 4M brighteners are effective, economical addition agents for bright "out of bath" requirements on barrel, still, semi and full automatic work.

C-42 addition agent permits uniform coverage on parts having a wide range of cathode current densities . . . up to 200 amps per square foot—without burning. Produces a fine grained product, perfect for secondary coatings, such as the Proseals, and bright "out of bath" work, when used with B 4 and B 4M.

The Proseals are durable, easily applied chromate coatings for extended life under adverse service. In bright, bronze or olive drab.

Remember too . . . the complete line of Promat products for metal preparation and plating finishes are backed by responsible on-the-spot service and are the result of years of field and laboratory research, dedicated to serviceable products . . . for an *enlightened* industry. Write for bulletin 29P today;

PROMAT Division

Poor & Company

851 S. Market Street
Waukegan, Illinois

The only filter on the market you can **LEARN TO OPERATE IN ONE MINUTE!**
CLEAN COMPLETELY IN LESS THAN 15 MINUTES!

Sel-Rex

DOUBLE DUTY FILTERS

Cuts filter cleaning time to less than 15 minutes

No filter on the market can be completely cleaned and reassembled as fast as a Sel-Rex DOUBLE DUTY Filter.

The entire Annular element is secured to the tank cover—lifts out freely and easily for cleaning, either by hand or with the sturdy, hand-operated davit mounted on the tank of larger units. Messy handling of wet and dirty elements is eliminated—you can even clean an element used for carbon treatment without soiling your hands!

Other outstanding advantages:

Completely new Sel-Rex-designed mechanical seal pump sharply reduces maintenance. Pump seal replacement method has been simplified.

The compact design saves valuable shop space . . . the new Annular element gives DOUBLE the amount of filtration area and speed in the same space required by other filters. All Sel-Rex DOUBLE DUTY Filters can be used with either the new Annular element or porous stone—no additional parts are required for conversion.

Standard models from 250-18,000 GPH capacity.

Larger models built to specification.

So simple to operate — You can learn to perform ALL filtering operations in less than ONE minute—precoat . . . filtering . . . backwashing . . . or liquid transfer — even if you've never operated a filter before. Simplified, easy-to-read instructions are fastened to the front of the tank — can be read when operating valves are used. Valves are conveniently located, colored and numbered for quick identification.

WRITE TODAY FOR ADDITIONAL INFORMATION OR QUOTATION

Sel-Rex

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BULLETIN 155

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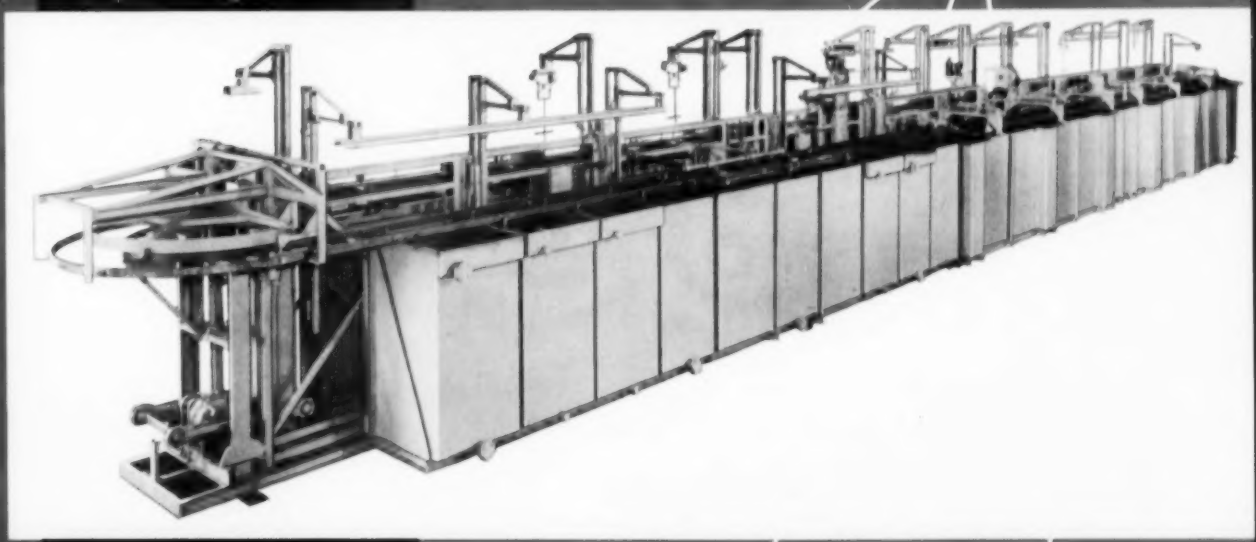
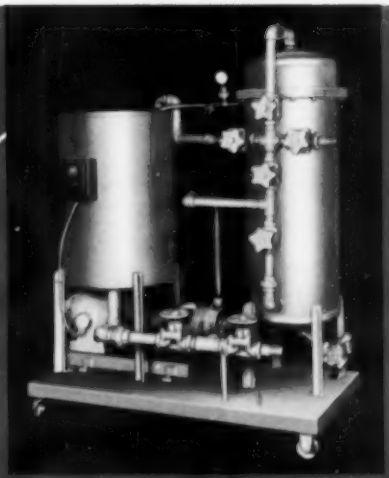
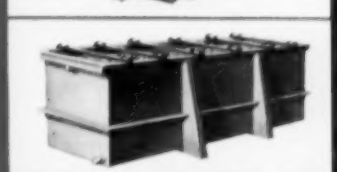
WAGNER BROTHERS
automatic plating equipment and supplies





RECTIFIERS
AUTOMATICS
SEMI-AUTOMATICS
FILTERS
TANKS & LININGS
ANODES
WASTE TREATMENT SYSTEMS



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Chicago • Rochester • Cleveland • Cincinnati • Indianapolis • New York

WAGNER PUTS THE "*AUTO*" IN AUTOMATION

If your metal finishing operations are still being carried on with obsolete equipment which loses money for you every day, we can put you ahead of your competition, increase your profit margin.

Increased production lowers the unit cost of your parts processing operations – you spend less for labor, less for power and increase your capacity to handle more business.

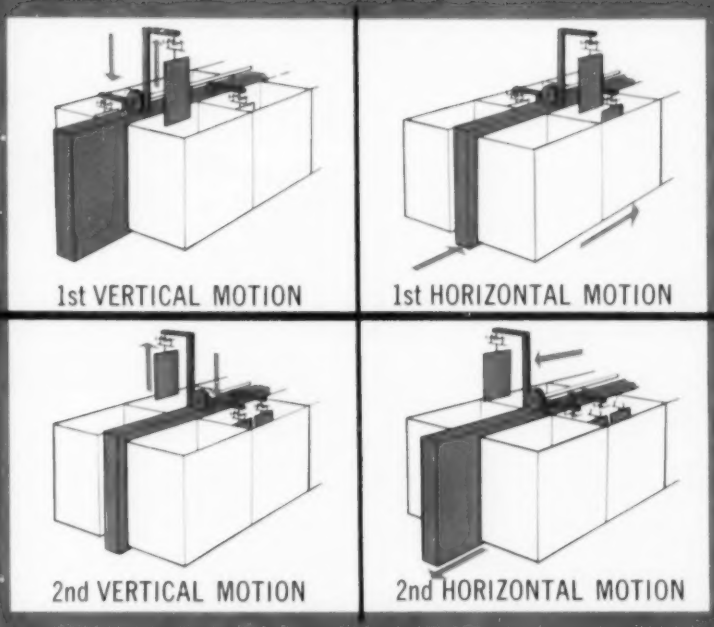
Wagner Brothers Full Automatic* Electroplating systems offer you a new and revolutionary concept in high-volume plating mechanisms – the product of years of engineering research and design refinements – for completely automatic cycling of your metal finishing operations.

*Patents Pending

Basic design details of Wagner Brothers Automatic Plating systems are described and illustrated in Bulletin 50-54, available free upon request.

AUTOMOTIVE MANUFACTURER MODERNIZES WITH WAGNER BROTHERS AUTOMATIC PLATING SYSTEM

This fully automatic plating system was recently installed at a Bay City, Michigan plant for one of the world's largest manufacturers of passenger cars. The unit is 203 feet long, 11 feet wide and operates under 16-foot head-room. Die cast parts are continuously processed through a 40 station copper-nickel-chromium cycle. Production rate is 100 racks per hour, using racks 24″ long, 10″ wide and 64″ deep. Power is furnished by one 25-HP motor. Unit is provided with a push-button central lubrication system, built-in rack stripper, vertical and horizontal agitation. Racks are automatically loaded, unloaded.



HOW IT OPERATES

All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic movements bring parts through the full plating cycle, one forward and reverse straight line horizontal motion and one raising and lowering vertical movement.

Plating racks are attached to work-carriers at the loading station. When the machine is started, lifting arms fixed to the carriage engage the work-carriers being transfered and lift them at all points on one side of the machine, carry them forward to the next station where they are lowered and disengaged from the lifting arm. Sequence is simultaneously produced in reverse on the opposite side so that, when lifting arms are lowered on one side, they rise on the other side.

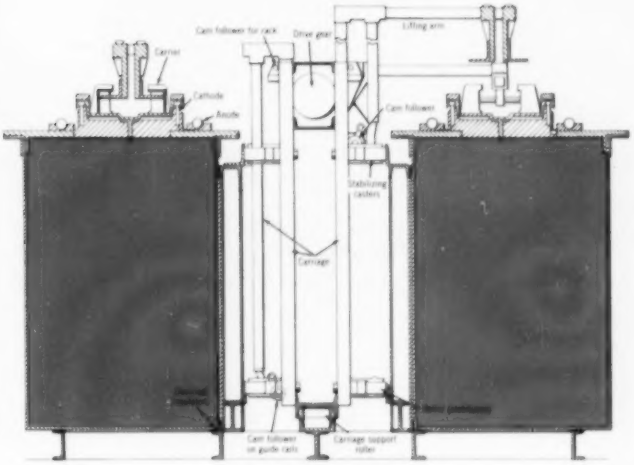
ADVANTAGES and FEATURES

SMOOTH OPERATION — Hydromotor power principle *eases* parts through the plating cycle without jolting starts and stops. Parts never jar from work-carriers into tanks.

LOW POWER NEEDS — Almost perfect balance of work load being lifted at one time requires only *low hydraulic pressures.* One 25-HP motor operates the 203 foot automatic shown.

SIMPLE INSTALLATION — Automatics are delivered to your plant either intact or in 2 or 3 completely assembled sections, depending upon size. *You avoid costly installation.*

MINIMIZED MAINTENANCE — There are fewer moving parts, no vibrating parts, no backlash in automation, low hydraulic pressures, no alignment problems. Overload protection is built into the hydraulic pump. Working parts are easily reached without disassembly.



The entire carriage mechanism is suspended on rollers moving in an oil-filled channel track. This carriage is motivated by a hydro-motor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.

OTHER FEATURES —

OPERATES UNDER LOW HEAD-ROOM REQUIREMENTS • NO OIL-DRIPPING CONNECTIONS OVER TANKS • TRIPLE CONTACT CATHODE BARS FOR SMOOTH CURRENT FLOW • AUTOMATIC HEAT CONTROL FOR ACCURATE RESULTS • CENTRAL LUBRICATION SYSTEM • EASILY VARIED DRAG AND DWELL TIME

In addition to high-volume plating, the Wagner Brothers Automatic is equally-well-suited to anodizing (sulfuric and chromic), phosphate coating, etching, electropolishing, oxide coating, etc.

WAGNER
BROTHERS, INC.
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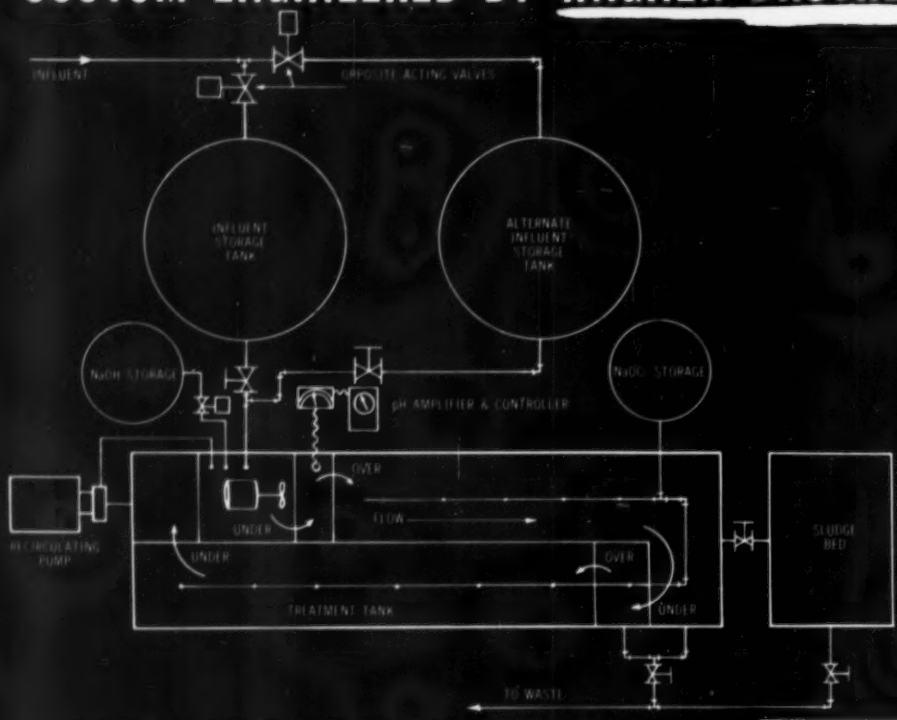
INDUSTRIAL WASTE TREATMENT SYSTEMS
CUSTOM ENGINEERED BY WAGNER BROTHERS



TYPICAL CYANIDE DESTRUCTION SCHEME

Wagner Brothers' engineers will design and install any type of waste treatment system, custom engineered to accommodate your particular plant requirements.

With Wagner Brothers Waste Treatment systems, you can be sure of *positive, economical* waste treatment requiring a *minimum of operating and maintenance cost.*

Write now, giving full details of your waste problems.

COMPLETELY ENGINEERED INSTALLATIONS FOR:

- **CYANIDE DESTRUCTION**
- **CHROMIUM RECOVERY OR DISPOSAL**
- **OIL EMULSION SPLITTING**
- **ION EXCHANGE**

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I'd like more information describing the products checked.

- ☐ Full Automatic Plating Systems
- ☐ Semi-Automatic Platers
- ☐ Electroplating Rectifiers
- ☐ Plating Solution Filters
- ☐ Tanks and Linings
- ☐ Anodes
- ☐ Nickel Brighteners
- ☐ Waste Treatment Systems
- ☐ Others _____

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

Industry News

compensation records as well as regulation and shortened payroll summaries, were prepared by a committee of certified public accountants.

Crippen & Ehrlich Labs., Inc. Joins Foster D. Snell, Inc. Dr. Foster Dee Snell announces the purchase by Foster D. Snell, Inc., Chemical and Engineering Consultants, 29 West 15th Street, New York 11, N. Y., of the Crippen and Erlich Laboratories, Inc., of 1138 East North Avenue, Baltimore 2, Maryland.

Snell

Raymond C. Crippen founded this laboratory in 1949 after spending several years as a graduate assistant in chemical engineering at Johns Hopkins University and later as director of research for Penniman & Browne, Inc., of Baltimore. The original laboratory was expanded in early 1954 to take care of increased business. Under the new ownership Crippen will continue as Secretary-Treasurer of the corporation and director of the laboratory which will operate for the present as a wholly owned subsidiary of Foster D. Snell, Inc. The other officers of the new subsidiary will be Dr. Foster Dee Snell as President and Dr. Chester A. Snell as Vice President.

The Baltimore laboratories include an analytical lab, an instrument laboratory, a fuel and oil testing laboratory, an organic laboratory, a paint and varnish laboratory, a small machine shop, pilot plant, and metal analysis and corrosion testing laboratory. The merger makes available to firms in the Baltimore area the many years' experience of the Snell organization in such fields as insecticides and disinfectants, rubber products and plastics, soap and other detergents, abrasives and polishes, as well as market research. The Snell organization also has vitamin and toxicology laboratories at Bainbridge, N. Y., through its Supplee Division.

"Hard-Nosed" Grinder Rest—When this tool maintenance man at Scio Pottery, Scio, O., found the steady rest of his grinder wearing away—giving him a hard time in reproducing proper grinds on carbide chipping and finishing tools—he "fought" carbide with carbide. He licked the problem by brazing a standard Carboloy grade 883 carbide tool blank to the rest. Now, hundreds of tool grinds later, the wear resisting carbide "nose" is still as effective as the day it was joined to the standard rest.

Canadian Transaction. William Whalen, vice-president and general manager of Canadian Hanson & Van Winkle Company Ltd., announces their purchase of the business and assets of Frederic B. Stevens of Canada Ltd. The transaction was concluded in early January.

Canadian Hanson & Van Winkle Company Ltd., are Canada's senior supplier to the Canadian Metal Finishing Industry. They operate two manufacturing plants in Toronto and have an office, warehouse, and service laboratory in Montreal and Resident representatives in the principal industrial centers in Canada. The acquisition of Stevens adds an important link in Canadian Hanson's program, in particularly providing office, warehouse, and manufacturing space in Windsor plus additional office and warehouse space in Toronto.

Foundry Sales are being handled by a separate sales division and the metalfinishing activities are being merged into the present organization.

In addition to Hanson's exclusive representation in Canada of the Udylite Corporation, they also assume in this transaction, sales representation of the following U. S. companies: Frederic B. Stevens Inc. of Detroit, Mich.; MacDermid Incorporated of Waterbury, Conn.; Roto-Finish Company of Kalamazoo, Mich.; Michigan Chrome & Chemical Company of Detroit.

These are in addition to other agreements now in effect with Industrial Filter & Pump Mfg. Co of Chicago; Detrex Corporation of Detroit and Acme Mfg. Company Limited of Detroit and others.

2 BIG EVENTS

under one roof

...featuring 1001 ideas for better finishing!

1 THE 1955 INDUSTRIAL FINISHING EXPOSITION

The first finishing show in three years . . . and it'll be jam-packed with exhibits. See all of the latest ideas for better finishing under one roof. Keep up-to-date in the fast-changing industrial finishing industry the easy way . . . by attending this big Exposition.

2 THE 42nd ANNUAL CONVENTION OF THE AMERICAN ELECTROPLATERS' SOCIETY

Don't miss this opportunity for a mutual exchange of ideas. This is your chance to see, hear and talk to all of the people who have contributed engineering advancements, research and know-how to industrial finishing.

ONE IDEA from the Exposition or Convention may save your company thousands of dollars!

Plan now to attend...

JUNE 20, 21, 22, 23, 1955

PUBLIC AUDITORIUM CLEVELAND, OHIO

For Expedited Registration Cards or more information, write:

HAROLD E. BARTLETT
Exposition Manager

1955 INDUSTRIAL FINISHING EXPOSITION

c/o American Decorating Company, 1849 W. 24th St., Cleveland 13, Ohio

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 413.

Intersociety News

Members of the Board of Directors of Twin Cities Chemical from left to right include: Sidney O. Lancaster, Diamond Alkali Company; Arthur A. Hibbeler, Retiring President, Monsanto Chemical Co.; John F. Chaney, Hazel Atlas Glass Company; James F. Kerns, Columbia Southern Chemical; John D. Schofield, Barrett Division (not present for picture) Officers: Ted A. Wamstad, Mallinckrodt Chemical Co., Treasurer; Clifford P. Barth, Merchants Chemical Co., Vice-President; William J. Fenelon, Hilex Company, President; Norman P. Anderson, Hawkins Chemical Co., Secretary

Twin Cities Chemical Elects Officers

The Twin Cities Chemical and Allied Trades Association announces the election of officers and members of the Board of Directors for the year 1955.

This Twin City organization is enjoying its second birthday; and if its first year of growth can be construed as any criterion, 1955 should be a banner year. This group, whose function is a counterpart to that of many other similar organizations in and around the country, offers a common meeting ground for the members of the chemical industry and all its allied trades. In this great chemically expanding northwest area, this organization has proved a great boon to its members. There are two types of members; namely, resident and non-resident. Luncheon meetings are held on the third Monday of the month, and a cordial invitation is offered to all allied chemical people to attend our luncheon when in the Twin Cities.

ASTM Issues Methods for Chemical Analysis of Metals

The ASTM Administrative Committee on Standards this fall approved for publication four new tentative methods of test proposed by Committee E-3 on Chemical Analysis of Metals.

Tentative Photometric Methods for the Chemical Analysis of Electronic Nickel (E 107) and Tentative Methods of Chemical Analysis of Copper-Beryllium Alloys (E 106) are both new procedures for materials not previously covered, the latter providing analyses for the alloys covered by Specifications B 194, B 196 and B 197.

In Tentative Methods for Chemical Analysis of Ferro-Alloys (E 31), the committee developed a new procedure for silicon that is equivalent in accuracy and more rapid in performance than that now covered in Sections 58, 59, and 60 of E 31; they are intended eventually to replace those methods.

Tentative Photometric Methods for the Chemical Analysis of Lead, Tin, Antimony, and their Alloys (E 87) were revised by a task group of the committee which felt it necessary to change the technical content of Sections 11 through 13.

Nuclear Congress in December

Under the leadership of Engineers Joint Council, a dozen organizations, representing more than 250,000 American scientists, engineers and industrialists, have united in announcing a Nuclear Congress and Atomic Exposition to be held December 12–17 in Cleveland.

The basic objective of the Congress is to launch a continuing program of interchange of information on the developing applications of nuclear science by the engineer for vital national benefits involving industry, agriculture, medicine and the public welfare.

Announcement of the Congress was made jointly by Dr. Thorndike Saville, president of Engineers Joint Council and Dean of Engineering at New York University; Dr. John R. Dunning, chairman of the General Committee on Nuclear Energy and Science and Dean of Engineering at Columbia University; and Dr. Donald L. Katz, chairman of the Nuclear Congress Program Committee and chairman of the Chemical and Metallurgical Engineering Department at the University of Michigan. An Exposition to be held in conjunction with the Congress was announced by Prof. Barnett F. Dodge, president of Yale University and president of the American Institute of Chemical Engineers, direct sponsor of the Exposition.

Giesel Chairman of Chicago EPI

The Chicago Electro-Platers Institute has elected Robert L. Giesel, President, Adolph Plating, Inc., as Chairman to succeed Charles N. Jensen, Jensen Plating Works. Also elected weer John Lietz, B. Mercil & Sons Plating Company, who succeeds Giesel as Vice Chairman, and Harold W. Baker, Electro Galvanizing Company, succeeding Lietz as Secretary-Treasurer.

Giesel

Elected to the Board of Directors were retiring Chairman Jensen, Erwin Elies, Berteau-Lowell Plating; William Blacklidge, Craftsman Plating & Tinning Corp.; Philip Ritzenthaler, Plating Engineering Co.; and John Samaras, C. S. Samaras & Son.

OBITUARY

Dr. Jean Saluze, a member of the Electrochemical Society for many years, died at his home in Paris on February 24, 1955. During recent years he was associated with the Société des Accumulateurs Fixes et de Traction, at Romainville, near Paris, especially with their electroplating activities. He was the author of a valuable book on electroplating, entitled "Traité Galvanoplastie," the second edition of which appeared in 1950.

He will be remembered and missed by his many American friends whom he entertained in Paris.

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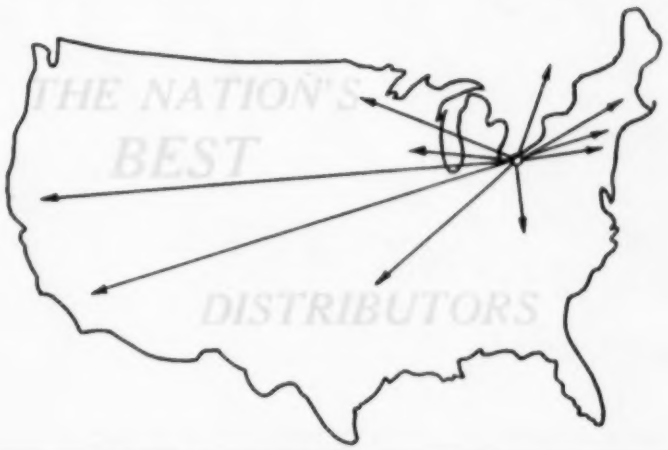
Distributors of ROHCO PRODUCTS are selected to give you the benefit of years of experience in plating procedures. All ROHCO PRODUCTS are the culmination of creative research on production requirements for the best in plating. ROHCO is your assurance of Quality, Service and Superior Plating Performance.

ROHCO



THESE PRODUCTS ASSURE BETTER PLATING . . . AND A BETTER DEAL FOR YOU!

NO-CRO-MIST (Triple Power)—Soluble addition agent to control chrome spray. Proved essential in hundreds of thousands of gallons of chrome baths.

20XL CADMIUM BRIGHTENER—Without equal for superlative cadmium plating. Pays for itself many times over.

100 BARREL and 303 STILL ZINC BRIGHTENERS—for starlight bright zinc deposits.

PERMA-BRITE "S" (still or automatic) and PERMA-BRITE "B" (barrel) ZINC BRIGHTENERS—for most economical bright deposits.

ZINC PURIFIER—Keeps zinc bath in tip-top condition; minimizes brightener consumption.

RINS-AID—Added to rinse tank: Repels water; helps prevent staining; saves buffing—all at negligible cost.

HULL CELL EQUIPMENT—Essential to every plant. For bath control to give peak production and quality. Specially designed COMET, B-1000 and B-267 Rectifiers for proper Hull Cell tests and general laboratory use. Model "WT" Hull Cell now available for tests at elevated temperature. New Porcelain Hull Cell.

HANGING HULL CELL—A new development designed to make plating tests right in the plating tank, or through the complete sequence of plating operations.

CURRENTESTER—specially designed oscilloscope for platers to detect hidden defects or irregularities in rectifiers.

R. O. HULL & COMPANY, INC.

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COOLest

RUNNING BUFF on the MARKET

Automatic UNIT

SELF-COOLING DESIGN

Special unit design circulates air throughout every fibre, even in high-speed operation

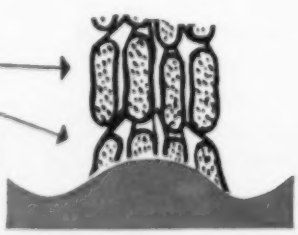
COOLER RUNNING

Air-cooled Permanent Center prevents burning or discoloration even at highest speeds

FLEXIBLE

Individual "Units"

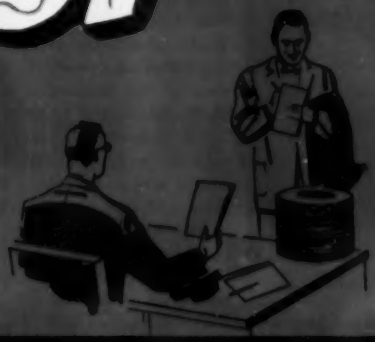
follow every contour—over high spots and into crevices—give top notch efficiency on all irregular and contoured surfaces



VERSATILE *HEAVY-DUTY BUFF*

HOT-est

SELLING BUFF
in the INDUSTRY



SISAL BUFF

"HOT" idea for "COOL" savings

Fast-cutting Sisal and safe, higher speeds reduce finishing time and costs

"Permanizing" process locks Sisal Fibres together . . . eliminates loose ends and scratches . . . will not fray

Cloth-wrapped Sisal units cut and color in one operation . . . get work done in fewer passes . . . use less buffing compound

Also available with patented "CENTERLESS" construction.

FREE! Handy "BUFF SELECTOR" WALL CHART
instantly tells you the right buff . . . right size . . . right speed for every job! Sent to buff users only. *Write for yours today!*

"For the Job That's TOUGH, Use an AMERICAN BUFF"

AUTOMATIC BUFF CO. DIVISION OF

American Buff Company

2414 S. La Salle St. Chicago 16, Illinois CAlumet 5-1607

Personals

Appointment of **William A. Damerel** as a vice president and **Dr. Fred Schulman** as assistant director of research, has been announced by **Admiral Alan G. Kirk,** chairman of the board and president of the Mercast Corporation.

Kirk

Damerel will be responsible for marketing and technical sales activities; part of his new duties will be the investigation and development of new markets for the Mercast (frozen mercury) process of investment casting. Damerel was formerly works manager of the American Bosch Company.

Schulman will be associated with the research activities of Mercast and will aid in the expansion of research activities of the Mercast Corporation. Schulman was formerly technical director for Herrick L. Johnston, Inc., Columbus, Ohio; he is still a director of this company. Prior to that, he was a member of the Chemistry Branch of the Office of Naval Research, where he was responsible for planning and administration of part of the Navy's basic research program.

A new board of directors of the Alloy Precision Castings Company, Cleveland, was unanimously elected at a special meeting of the company's stockholders. The special meeting was occasioned by the recent additional acquisition of Alloy stock by the Mercast Corporation, New York. Alloy Precision is a Mercast licensee.

Elected as chairman of the board was **Admiral Alan G. Kirk,** also chairman of the board and president of Mercast; additional board members elected were **Ronald D. Gumbert, Waldo Hatch, E. D. Hopper,** and **Peter D. Kleist.**

Following the stockholders' meeting, a board of directors meeting unanimously elected new officers of the company. These are in addition to Admiral Kirk, Ronald D. Gumbert, who was re-elected as president and chief executive officer; **James J. Laughlin** who was elected secretary-treasurer; and **Theodore Hart,** elected assistant treasurer. Gumbert also serves as vice president of Mercast.

Two new abrasive engineers and a new field engineer have been appointed by Norton Company of Worcester, Mass. Territory changes for two other abrasive engineers were also announced.

Laurence G. Holfelder has been assigned to the central Indiana territory. **James A. Coleman** will cover the territory in the area of Kansas City, Mo., and **Raymond B. Goodale** has been appointed a field engineer at Norton's Chicago district office. All three are former members of the Sales Engineering department.

In the territory changes, **William A. Simonds** will now cover Northern Texas and **Paul B. Foxwell** has been shifted from Kansas City to cover Southern Texas.

F. J. Stokes Machine Company, Inc., Philadelphia, has announced the appointments of **J. Gordon Seiter** as manager of its newly established High Vacuum Division and **G. Jewett Crites** as manager of the Vacuum Processing Division. The separation of Stokes vacuum equipment operations into two divisions reflects the rapid growth of Stokes vacuum business in recent years.

Crites Seiter

John F. Maguire, Jr., has joined the Stokes headquarters staff as manager of drum dryer and flaker sales, and **Kendrick C. Taylor** has been placed in charge of vacuum furnace sales.

Dr. Donald Price, widely known authority on surface-active agents, detergents and cleaning materials, and author of the book, entitled, "Detergents, what they are and what they do," has entered the consulting field. Dr. Price, who holds thirty-five U. S. and foreign patents, and is author of more than twenty-five original research and technical papers in the fields of organic chemistry, vitamins, oils and fats and surface-active agents, will specialize in surface-active agents, cleaning materials, the chemistry of oils and fats and research management.

Price

After receiving his Ph.D. degree at Columbia in 1930, Dr. Price spent two years in research in Europe at the Universities of Cambridge and Munich and taught at Columbia for five years.

Among the well known firms with which Dr. Price has been associated are National Oil Products Co. (now Nopco Chemical Co.), Harrison, N. J., where he was technical director, and Interchemical Corporation, New York. Since 1945 he has been technical director of Oakite Products, Inc., nationally known manufacturers of industrial cleaning materials.

Dr. Price is active in a number of scientific and technical societies and has been a trustee of The Chemists Club and chairman of its Library Committee. He served as chairman of the important Research Committee of the AES 1951–52.

To meet the ever-increasing demand for fine quality paint, abrasive and feed ingredients, the Raw Materials Division of Tamms Industries, Inc., of Chicago, has recently appointed new representatives in the following areas: **Robert Chenoweth,** 531 Esperson Bldg., Houston 2, Tex. **Victor Roberson Co.,** 4515 Olive St., St. Louis 8, Mo. **Russell & Palmer Co.,** P. O. Box 2674 Custom House Station, New Orleans, La. **Robert F. Sheahan Co.,** Suite 728 M & M Bldg., Memphis 2, Tenn. Each of these representatives has a wide acquaintanceship among paint and varnish, abrasive and feed manufacturers in his respective territory and should contribute much to Tamms' continuing program of service expansion in these raw materials fields.

In line with its policy of greater expansion into the eastern market, the L-A Water Softener Company, of Los Angeles, Calif., has named **Howard G. Egginson** Eastern Divisional Manager.

Egginson

Egginson has been active in the development and sales of water conditioning equipment since 1941, and has served with several major companies during that time. As eastern divisional manager for L-A Water Softener Company, he will take charge of all sales activities east of the Mississippi, including the appointment of new representatives to handle the complete line of modernized L-A Water Conditioning Equipment and Deaerators.

Frank Romanoff, one of the foremost electro-chemists in the country, has been named Technical Director in Charge of research and production processing operations at both the Chicago and Bethlehem

the original!

UNICHROME ROUND ANODES

PROVE THEIR WORTH

with

- *Longer Anode Life*
- *Better Current Distribution*
- *Savings in Maintenance*
- *Lower Plating Costs*

Chromium platers get better service all around from the Unichrome original round anode

- In replacing "flats" with *Unichrome Round Anodes*, an automotive plant saved as much as their initial cost — by eliminating former weekly maintenance cost for lifting out flat anodes, brushing them clean and correcting warpage, all at overtime pay. What's more, the anodes plated better with *less power*, enabling a $29,000 standby generator to be switched to other work!
- Merely by switching from flats to *Unichrome Round Anodes*, another plant cut hard chromium plating time by a cost-cutting 20%.
- Through the better current distribution of *Unichrome Round Anodes*, a third user got better coverage on small parts, eliminating all rejects due to "shadowing"!

THE FACTS are in. Working proof of greatly improved lead anode performance is being obtained in more and more users' plants. The new, special alloy cylindrical anode developed originally by United Chromium is contributing in a big way to better chromium plating operations.

Here's why: Cylindrical shape gives better and more efficient distribution of current for better plating. (Watch the entire surface "gas" in the tank — evidence of more active anode area.) This not only prevents corrosion and fouling at the "back" of anodes but also stretches service life. More rigid too, the round shape stops warpage.

This original Unichrome design is no experiment — it is actually paying off on the job. Get in touch with your nearest office of United Chromium for complete details on this money saver.

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equipment • processes • materials

for better plating at a better profit

UNITED CHROMIUM, INCORPORATED

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Too Strong — if it was dumped untreated into a stream or municipal sewage system. Toxic cyanide wastes can be completely oxidized and destroyed at controlled pH values by the widely used alkaline chlorination process.

Based on the experience of hundreds of installations in the metals treating and finishing industries, Wallace & Tiernan is prepared to help you solve, in conjunction with your Consulting Engineer, any cyanide or chromium waste problem.

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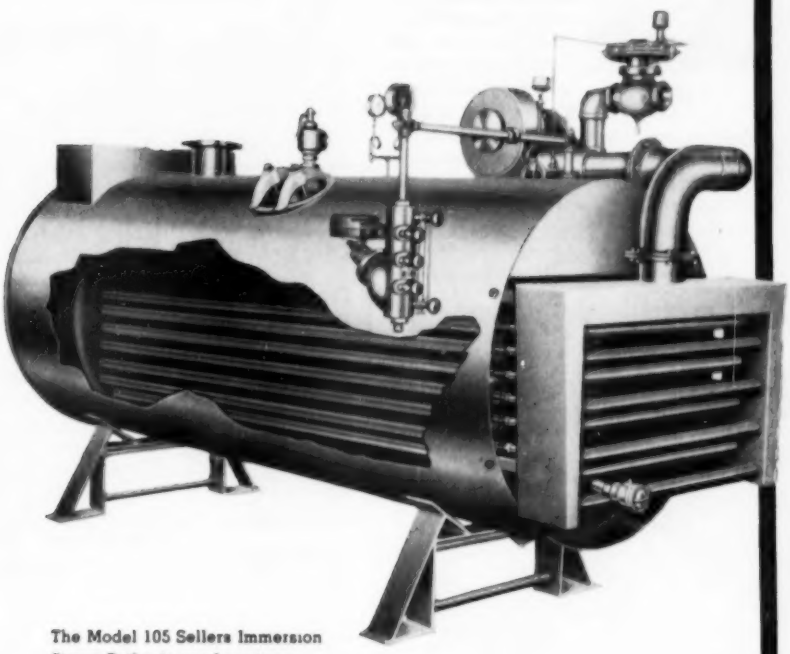
SELLERS BURNS GAS "INSIDE THE WATER"



The Model 105 Sellers Immersion Steam Boiler is another steam boiler designed and built with totally submerged and horizontally located firing tubes.

This system of firing permits all gas to be burned inside the submerged tubes — and therefore *inside the water.*

Every tube is an individual combustion chamber with its own burner — *completely surrounded by water.* This is the most efficient method ever devised.

And this system permits "spreading out the fire" — to put every square foot of heating surface to work, increasing life, internal circulation, and operating efficiency.

The Sellers Model 105 Immersion Steam Boiler is only one of a complete line — all are companion boilers to the famous Sellers Model 46. Investigate this line — there is one to fit your requirements.

BEFORE YOU BUY ANY STEAM BOILER, CONSIDER THESE FACTS

- ***MINIMUM SCALE PROBLEM***
  Intermittent firing of the boiler brings about alternate expansion and contraction of the firing tubes which loosens scale which might form on the tubes. This scale drops to the bottom of the shell out of the firing zone and cannot bake on to the firing tubes. Clean out openings are provided.
- ***CONTINUED HIGH EFFICIENCY***
  As long as firing tubes are kept clean, original high efficiency is economically maintained.
- ***NO WATERLINE CORROSION***
  With all firing tubes totally submerged, there is no corrosion at the waterline—where tubes normally fail. In Sellers immersion type steam boilers, there can be no waterline corrosion.
- ***MORE EFFECTIVE INSULATION***
  More effective insulation is possible because the insulation is against heat loss from low temperature steam and water instead of a high temperature combustion chamber.
- ***FASTER STEAMING AND DRYER STEAM***
  Rapid steaming and dry steam takes place because of the large surface area of the water. All surface water is heated first since the firing tubes are located close to the water line.

Sellers

ENGINEERING COMPANY

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Immersion Steam Boilers

Blast Heaters

Immersion Tank Heaters

Combustion Units Industrial Gas Burners

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Vertical Steam Boilers

Save Dollars Now!

SELLERS ENGINEERING COMPANY
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Chicago, Illinois

☐ Please send us complete information on the Sellers 105 Model Steam Boiler.
☐ Send us the Tell-All folder on the Sellers complete line of steam boilers.

Name_____

Company_____

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City_____ State_____

Dept._____

Personals

plants of Apollo Metal Works. This announcement was made from the Chicago headquarters of the company.

Romanoff is nationally recognized as a leading authority on nickel plating. During World War II, he participated in the vital Manhattan Project, making definite contributions to the first atomic energy program.

Apollo's operations will be somewhat familiar to Romanoff in that he was associated with the company some 15 years ago.

Fred Wagner, sales manager, Wagner Brothers, Inc., announces the recent appointment of **Jim Lekander** as salesman and service representative for the southern Michigan industrial area, including Toledo, Ohio.

Lekander

Lekander was formerly plating foreman and chemist with Industrial Stamping and Manufacturing Co. His background includes a widely diversified experience in the production and technical supervision of electroplating processes. He is an alumnus of Michigan College of Mining and Technology and of Lawrence Institute of Technology.

Maury E. Lippert, vice-president in charge of sales, of Sipi Metals Corp., announces the association of **Frank Turnbull** with the Sipi Metals Corp., of Chicago.

Frank Turnbull, a resident of Detroit, Mich., has been active in the non-ferrous metal field for over 35 years and is well known throughout the brass and bronze industry. He will operate from the Detroit office at 6432 Cass Ave., Detroit 2, Mich.

Sipi Metals Corp., non-ferrous smelters for many years, are producers of a complete line of alloys for the foundry and allied trades.

Daniel Meeker has been named vice president of Toledo Porcelain Enamel Products Company, Toledo, Ohio, manufacturers of porcelain enamel products, it has been announced by **Sylvan F. Chappuis,** president.

Meeker

Meeker has been with Toledo Porcelain Enamel since 1931, having been plant engineer, architectural engineer, district manager in New Jersey, plant superintendent and sales manager before his recent appointment.

Joseph R. Hughes has joined the sales and engineering staff of the Northwest Chemical Company to service accounts in Massachusetts and Rhode Island.

Hughes, a long time resident of Massachusetts, has for nearly twenty years worked with the metal finishing industry. His academic background and industrial experience, augmented by special training given by the Northwest Chemical Company, will enable him to render technical service of a high order.

Hughes will work out of his home office, 10 Mercer Road, Needham Heights, Massachusetts.

Promotion of **Edwin Vereeke** to the position of executive vice-president of Heil Process Equipment Corporation has been announced by that company. Vereeke previously had been vice-president in charge of sales for Heil, a Cleveland manufacturer of chemical-resistant tanks and linings, acid heaters, lead anodes, plastic ventilating systems and related products.

Vereeke

Vereeke has been with Heil since 1946. Prior to that time,

When you think of finishing & deburring

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The experience gained in over 70 years of machinery building has provided us with a bank of "Know-How."

Hundreds of manufacturers have found more efficient means of parts finishing by drawing on our bank of "Know-How." The Hammond "family" of Automatic Deburring and Finishing Machines covers a wide range of types and sizes.

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Personals

he spent three years as an officer in the United States Navy. He is a graduate of Ohio Wesleyan University, and a member of the National Association of Corrosion Engineers.

Glezen

Ganchan

In a major move at Automotive Rubber Company, Inc., **R. P. Ganchan** of ARco's Houston, Tex., plant was moved up to the Detroit administration office as a vice-president and general manager of the company. Ganchan's new position places him in close contact with **T. G. Meulenberg** and **R. L. Redmond,** president and vice-president of ARco. He will actively direct the operation of plants in Detroit and Kalamazoo, Mich.; Houston, Tex., and Savannah, Ga.

The same move made **R. H. Glezen** a vice-president and general sales manager for the company. In the past, Glezen has concerned himself as executive assistant in the development of new plants and exploiting new markets, as well as directing advertising and sales promotion.

Douglas C. Lynch, formerly executive vice president of Brush Electronics Company, Cleveland, has been named president of the company, according to an announcement by **W. Russell Burwell,** vice chairman of Clevite Corporation and former president of Brush Electronics. Brush, a unit of the Clevite Corporation, manufactures electronic instruments and is the country's largest producer of both higher-quality magnetic recording heads and piezoelectric crystal.

Lynch

Lynch joined the company in 1952, having previously been head of the international operations of Crosley Division of AVCO Manufacturing Corporation, and later a senior staff executive of Willys-Overland Motors, Inc. He holds a degree in mechanical engineering from Tri-State College, Angola, Ind., and from 1937 to 1947, was with Westinghouse Electric Corporation in a number of engineering, sales and management positions, finally as assistant general manager of Westinghouse International. Born of American parents in the Philippine Islands, in 1914, he returned there during the post-war reconstruction period as technical advisor to the islands' president. He is a member of the University and Mayfield Country Clubs, and of the Wall Street Club in New York City. He is married, has one son, and lives at 11432 Cedar Glen, in Cleveland.

Brush Electronics Company manufactures electronic instruments and is the country's largest producer both of higher-quality magnetic recording heads and of piezoelectric crystals. It is the second largest unit in the Clevite group of companies, which includes The Cleveland Graphite Bronze Company, Harris Products Company, Clevite Limited (Canada), and Transistor Products, Inc., of Boston, one of the leading companies in the transistor and diode field.

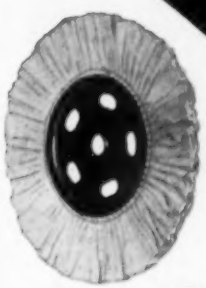
International Rectifier Corp. of El Segundo, Calif., has announced the appointment of the **Dale G. Weber Co.,** Portland, Ore., as their industrial and jobber representative in the States of Washington, Oregon, Montana and Idaho, as well as the territory of Alaska.

Dale G. Weber, capable head of the firm, is well known to the industrial and jobber firms in this territory and will assist with information and service for International Rectifier Corporation selenium rectifier products.

FORMAX

the Perfect Combination

FROM START TO FINISH



ZIPPO CLOTH BUFFS

These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.

BUFFING COMPOUNDS

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.

ZIPPO SISAL BUFFS

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

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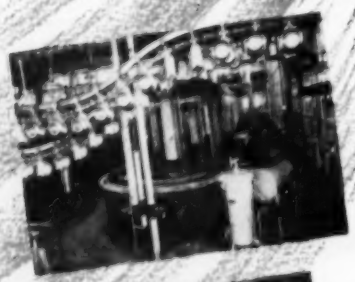
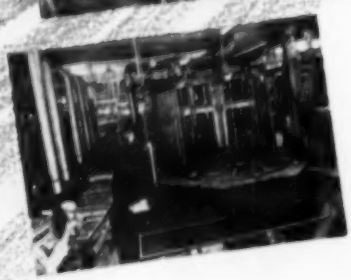
"THE FOUR McALEERS"

MEAKER

Automation...





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- Economical Operation
- Better Finish

Automation by MEAKER is the sure way to more successful plating, anodizing, phosphatizing and other processing operations — at higher speeds — thus lower cost. MEAKER builds automatic plating equipment especially to fit your operation, whatever it may be.

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Personals

John D. Joyce was recently appointed industrial sales manager of Blue M Electric Company's Industrial Division, Blue Island, Ill. Joyce, who was formerly associated with Claud S. Gordon Co., was graduated from Purdue University.

For the past number of years he has specialized in engineering, development, and sales of ovens, furnaces and instrumentation for the industrial and research fields.

R. M. Hammes has been appointed general sales manager of the Niagara Filters Division and the Tolhurst Centrifugals Division of American Machine and Metals, Inc., East Moline, Ill., succeeding **F. C. Weicker** who has resigned. Hammes has been with American Machine and Metals since 1943. He was previously assistant sales manager of the Niagara and Tolhurst divisions.

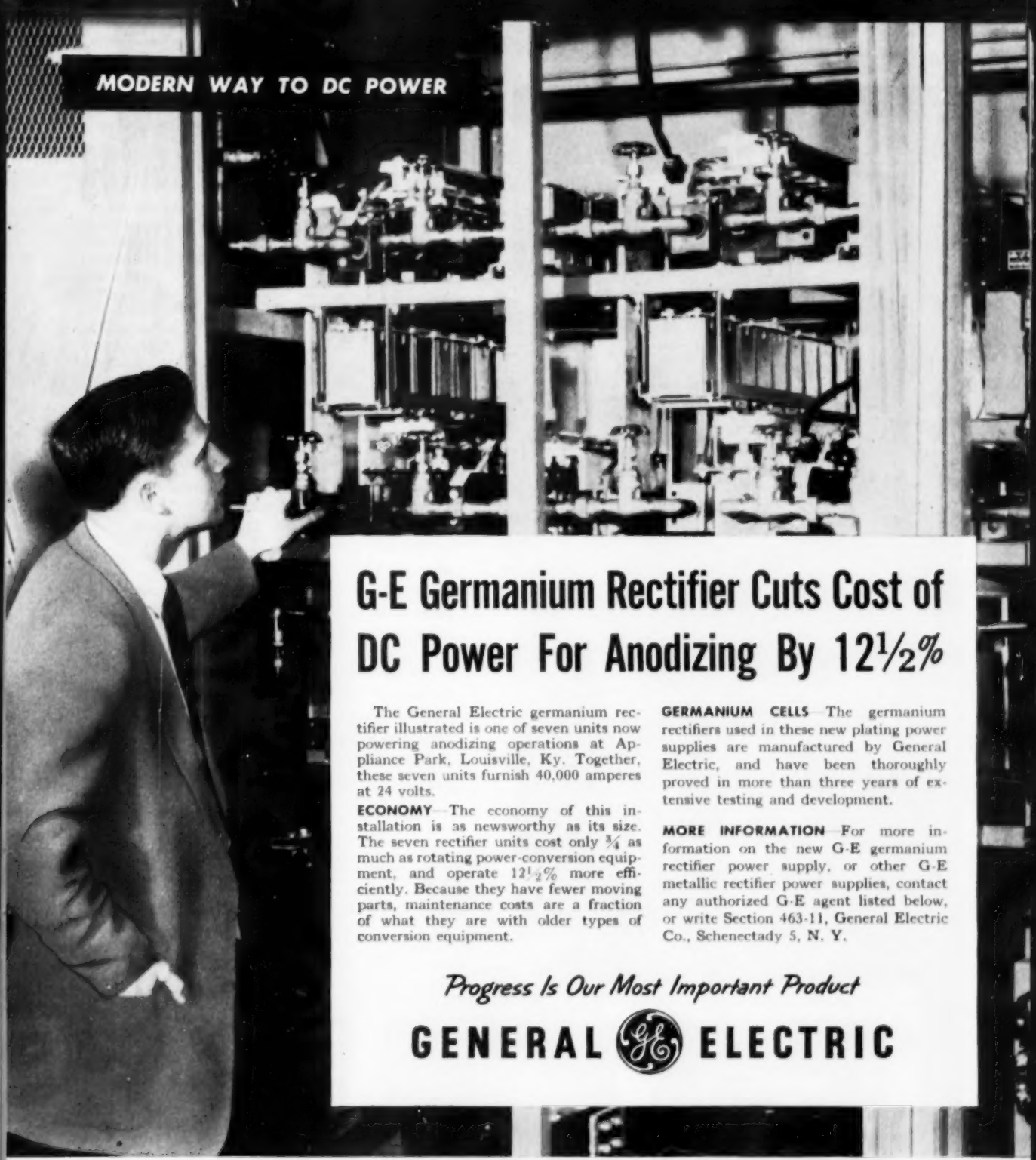
Samuel Atkins who has been associated with the home office of The Barnstead Still & Sterilizer Co., Boston, Mass., has now been appointed to head the company's New York office, it was announced today by **A. White**, general manager of the company.

Atkins assumed his new duties upon opening of the New York office on February 1 at 640 W. 239th St., New York 71, N. Y. Having spent over 12 years in the home office and factory, Atkins possesses a thorough knowledge and understanding of Pure Water problems as they affect commerce and industry, and institutional requirements. Complete information may be had at his office on both distilled water, and demineralized water equipment.

Federal Pacific Electric Company, Newark, N. J., has appointed **Joseph C. Langaunet** a product sales manager in charge of bus duct, trolley duct, and related equipment, according to **E. A. Williams**, general manager of the eastern switchgear division of the company. Langaunet began his new duties on February 1, in offices at Scranton, Pa., where Federal Pacific's new switchgear plant is located.

Prior to his recent appointment, Langaunet had been associated since 1942 with Westinghouse Electric Company, where for the past six years he was sales manager in charge of bus duct. Before that time he was connected with the West Penn Power Company, first as an engineer and later in power sales.

Langaunet is a graduate engineer of North Dakota State University. Following his graduation he took part in the Westinghouse Graduate Student Program.



G-E Germanium Rectifier Cuts Cost of DC Power For Anodizing By 12½%

The General Electric germanium rectifier illustrated is one of seven units now powering anodizing operations at Appliance Park, Louisville, Ky. Together, these seven units furnish 40,000 amperes at 24 volts.

ECONOMY—The economy of this installation is as newsworthy as its size. The seven rectifier units cost only ¾ as much as rotating power-conversion equipment, and operate 12½% more efficiently. Because they have fewer moving parts, maintenance costs are a fraction of what they are with older types of conversion equipment.

GERMANIUM CELLS—The germanium rectifiers used in these new plating power supplies are manufactured by General Electric, and have been thoroughly proved in more than three years of extensive testing and development.

MORE INFORMATION—For more information on the new G-E germanium rectifier power supply, or other G-E metallic rectifier power supplies, contact any authorized G-E agent listed below, or write Section 463-11, General Electric Co., Schenectady 5, N. Y.

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G-E PLATING POWER SUPPLIES ARE SOLD BY THESE AUTHORIZED AGENTS:

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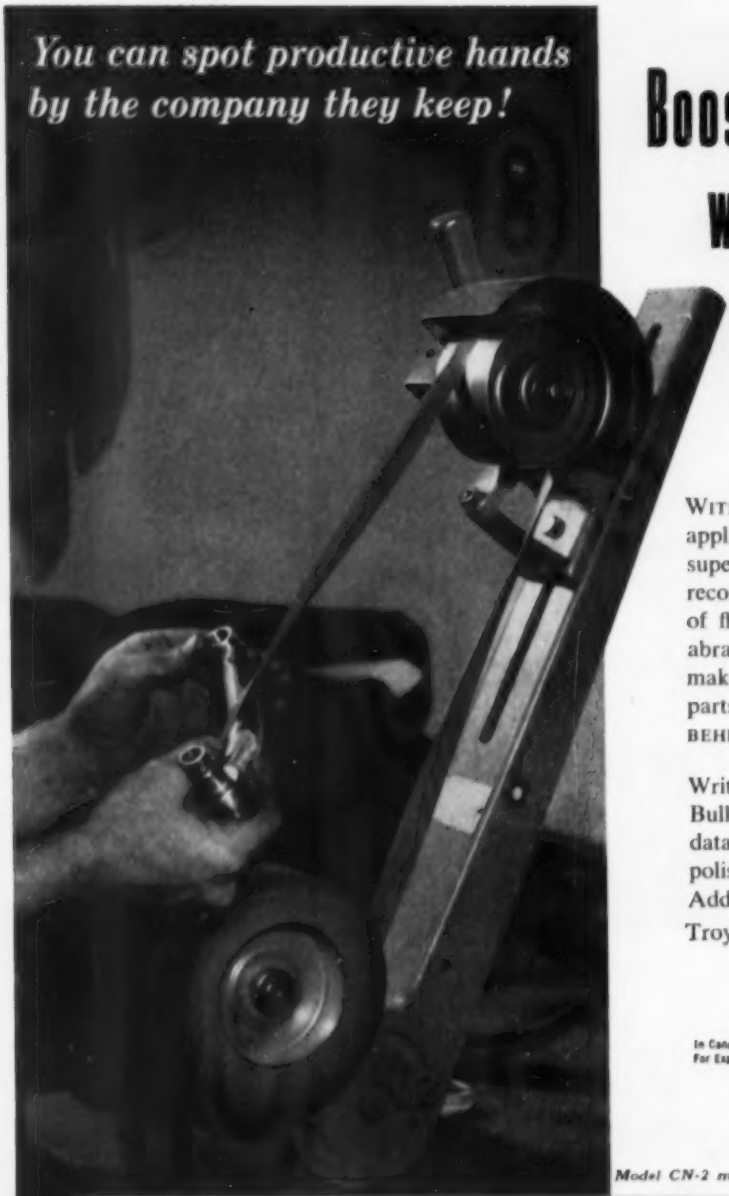
BELKE MFG. CO., Chicago, Ill.
THE CHEMICAL CORP., Springfield, Mass.
CLEVELAND ELECTRIC CO., Atlanta, Ga.
CONNECTICUT ELECTRIC EQUIPMENT CO., INC. Meriden, Conn.
ENTHONE CO., New Haven, Conn.
FITZPATRICK ELECTRIC SUPPLY CO., Muskegon, Mich.
W. M. FOTHERINGHAM CO., Buffalo, N. Y.
GENERAL ELECTRIC SUPPLY CO., Cleveland, Ohio
FRED GUMM CHEMICAL CO., Kearny, N. J.
J. & H. ELECTRIC CO., Providence, R. I.
LASALCO, INC., St. Louis, Mo.
LEA MANUFACTURING CO., Waterbury, Conn.
WILLIAM LYNN CHEMICAL CO., INC., Indianapolis, Ind.
MEAKER CO., Cicero, Ill.
CARL F. MILLER CO., Seattle, Wash.
J. C. MILLER CO., Grand Rapids, Mich.
GEORGE L. NANKERVIS CO., Detroit, Mich.
THE REYNOLDS CO., Philadelphia, Pa.
STANDARD PROCESS CORP., Chicago, Ill.
STANDARD WHOLESALE SUPPLY CO., Las Vegas, Nev.
UDYLITE, Detroit, Mich.

INDICATE A 424.

You can spot productive hands by the company they keep!



Boost contour polishing with Behr-Manning abrasive belts!

WITH THESE MODERN COATED ABRASIVE applications on hand, you can produce superior finishes on tricky contours at record breaking speeds. The combination of flexible, even-cutting BEHR-MANNING abrasive belts and up-to-date methods make this possible. Test them on your parts — in your plant or in a nearby BEHR-MANNING Demonstration Room.

Write for the Production Digest Bulletin. Contains 60 pages of detailed data on coated abrasive grinding and polishing techniques. Address Behr-Manning, Troy, N. Y., Dept. PL-4.

In Canada: Behr-Manning (Canada) Ltd., Brantford.
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Model CN-2 made by Engelberg-Huller Co., Syracuse, N. Y.

A favorite for dry fining and blending plumbing parts.

Smoothing the way to finer finishes on flat areas.

Tops for removing flash from difficult inside contours.

G-4

BEHR-MANNING® *division of NORTON Company*

▲ COATED ABRASIVES ▲ SHARPENING STONES ▲ PRESSURE-SENSITIVE TAPES

Personals

Alden H. Webber has been appointed to the position of field sales engineer for the Seattle area by The Bristol Company, Waterbury 20, Conn., according to an announcement by **H. E. Beane**, vice-president—sales.

Webber has been with the company since 1943. He spent his first three years as instrument serviceman for Bristol's New York office, and then was made field sales engineer for the same territory. He holds several patents in instrument design and parts. His knowledge and experience in electronic and automatic control instruments well fit him for the new position in the Pacific Northwest.

He will work out of Bristol's district office at 203 White Bldg., Seattle, Washington.

Two new appointments to home office sales posts were announced by **W. B. Watterson,** vice-president in charge of

Carkin

Church

sales for the Air Maze Corporation, Cleveland. The company manufactures air and liquid filters.

Bruce W. Carkin has been appointed sales engineer of railroad and original equipment installations. He was formerly associated with the Electromotive Division of General Motors Corporation in the design and development of railroad locomotives.

Watterson also announced that **Bennett T. Church** has been named manager of distributor sales. He previously served with Harvey Whipple, Inc., Springfield, Mass., as a factory representative.

Promotion of **James O. King** to the position of special staff assistant in the sales department of Diamond Alkali Company at its national headquarters in Cleveland, Ohio, was announced here today by **W. H. McConnell,** vice-president—sales. The appointment is effective immediately.

King comes to his new post following four and a half years experience as a member of Diamond's southwestern district sales staff. He has represented the company in a sales and service capacity since July, 1950, in certain sections of Oklahoma, Kansas and Colorado.

A native of Oklahoma, born in Sentinel, King joined the Diamond organization shortly after graduation in 1950 from the University of Tennessee, Knoxville, where he earned a B.S. degree in chemical engineering, and was immediately assigned to the company's southwestern district sales staff at Houston, Texas.

Michael P. Apostolik has become manager of Wheeling Steel Corporation's New York District Sales Office, according to an announcement from **W. M. Hall,** General Manager of Sales. He succeeds **Harold W. Schroeder** who recently retired from active service with the company after being affiliated with Wheeling Steel for 39 years.

Apostolik joined Wheeling Steel in 1925 when he was given a job as order typist. In 1931 he became a full-time salesman in

Schroeder

Apostolik

the New York Office, in which capacity he served to the present time.

Schroeder, a well-known sales official, had a long career with the corporation, having started as a metallurgist in the LaBelle Iron Works at Steubenville, Ohio in 1915. Upon his retirement he was retained by the corporation as a consultant.

guard against Rejects

"Sealed-Disc" Filters were designed especially for plating rooms. They're smaller, compact, and more portable than ordinary conventional Filters, and they are also performing satisfactory results on many acid dips, electro cleaners andsolvents.

You can be sure with a "Sealed-Disc" Filter

More and more cost-minded platers depend on Alsop *"Sealed-Disc"* Filters to remove dirt, dust, and sludge from their plating solutions. They get better finished plated work, they save time and labor, and their plating solutions last longer. The *"Sealed-Disc"* Filter assures positive, trouble-free performance that's proof against even the invisible impurities that cause nodules and porousness, proof against rejects and reworking. There's a *"Sealed-Disc"* Filter *"to fit your job"*—write for complete information, the Alsop Engineering Corporation, 1004 Fine Street, Milldale, Connecticut.

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Filters, Filter Discs, Pumps, Tanks, Mixers, Agitators

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 426.

the finest strippers of all

are in NORTHWEST drums

"Step right up Gentlemen, you ain't seen nuttin' yet."

And you haven't until you've seen Northwest's Strippers in action.

These high-speed babies really "peel" organic finishes. Built to cope with all types of paints on metals or plastics — Northwest Strippers give you a clean surface ready for repainting in one run-through.

Northwest Strippers are Safe — no fire hazard, no odor, no fumes, non-toxic.

Northwest Strippers are Sure — parts are fully cleaned — metal surfaces are unharmed — long life is assured — economy is proven.

Northwest Strippers are Soluble — film is converted into a form which can be rinsed off with water spray — contains no chemicals which can't be flushed through sewers.

Call your Northwest Cleaning Specialist for the right stripper to do any job.

Remember — YOUR COST PER FINISHED ARTICLE IS THE TRUE COST OF YOUR CLEANER.

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control *serving you since '32*

REPORTS from all over

. . . stripped, cleaned and degreased

(This section is especially compiled for the readers of PLATING; here the world in which we work and operate is stripped of its veneer, cleansed of its distortions and carefully degreased of superfluities).

Over-all business begins to look like a record-breaker in 1955. We're above '53 peak and there will be continued good business in the second half. People are optimistic; expect higher incomes; foresee good times; mood generally UP.

No tax relief can be expected this year . . . interest rates have continued to creep up . . . normal seasonal decline in business loans is much smaller than usual.

METALS—Zinc was a disappointment to producers who expected a price rise to above 11½c basis . . . Copper was very strong with the price rise attributable to Rhodesian mines' work stoppage . . . Tin grew firmer in February . . . Aluminum hit a new high of 128,203 tons in January.

Quotations on all metals stand:

ALUMINUM—(99 per cent pure plus ingot)	23.200
ANTIMONY—Five tons or more but less than carload	31.970
Bulk	28.500
In cases (Port Laredo)	29.000
CADMIUM—Producers' quotation	170.000
Producers' and platers' quotation	170.000
Platers' quotation	170.000
COPPER—Electrolytic, domestic	32.700
Electrolytic, export	36.236
GOLD—(per ounce U. S. price)	$35.000
LEAD—Common, New York	15.000
Common, St. Louis	14.800
MAGNESIUM—(ingot)	27.000
MERCURY—(per 76 lb flask)	$322.000
NICKEL—(F.O.B. Port Colborne U. S. duty included)	64.500
PLATINUM—(refined per oz)	$78.545
SILVER—New York, per/ounce	85.250
London, pence/oz	74.238
TIN—New York	90.835
New York, 99 per cent min	89.835
ZINC—Prime Western (E St. L.)	11.500
Prime Western (delivered)	12.000

BUILDING—New structures in Cincinnati and Pittsburgh will use aluminum with anodized colors and protective coating over the anodizing.

CHEMICALS—*Sunlight Chemical* soon will make available ammonia in metal cans . . . *Metal Hydrides* made available a micron-range sodium hydride as an oil dispersion agent . . . properties of *Reynolds Aluminum* bus conductor are such as to provide a bus with the same strength in the direction of short-circuit forces as has copper . . . *Schenectady Varnish Co.* claims its heat reactive insulating varnish (186) will eliminate buzz and hum in stators, transformers and coils.

LIQUIDS HANDLING—*Cadillac Gage* has introduced a servo valve for controlling hydraulic flow proportionally to an imput current signal . . . ultrasonics has so far failed in carbon black agglomeration, dust precipitation and milk homogenization, but shows promise for flavor extraction in brewing, accelerating electrochemical reaction, promoting difficult emulsifications and non-destructive testing in quality control.

CORROSION—the Navy will begin coating the insides of gun barrels with chromium to extend firing life and to serve as a protective coating while guns are "moth balled" . . . *Pennsalt*, Phila., has introduced Thick-Coat, a new resin coating product for protecting new or corroded metal, concrete or wood exposed to humid and corrosive atmospheres . . . a new solderable zinc alloy plating process providing corrosion protection of zinc and solderability of tin or cadmium at a cost only slightly greater than that of zinc has been announced by *Sylvania Electric*. The new type plating solution procedure operates with soluble alloy anodes. The zinc alloy bath combines conventional tin and zinc plating solution in an unusual manner . . . A high speed silver recovery system requires only 4 sq ft of floor space for the sump tank and head room of 8 ft.

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A 165–53. Electrodeposited Coatings of Cadmium on Steel
A 166–53 T. Electrodeposited Coatings of Nickel and Chromium on Steel (Tentative)
B 141–45. Electrodeposited Coatings of Nickel and Chromium on Copper and Copper-Base Alloys
B 142–53. Electrodeposited Coatings of Nickel and Chromium on Zinc and Zinc-Base Alloys
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B 177–49. Chromium Plating on Steel for Engineering Use
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B 242–53. High-Carbon Steel for Electroplating, Preparation of
B 252–53. Zinc-Base Die Castings for Electroplating, Preparation of
B 253–53. Aluminum Alloys, Preparation of and Electroplating on
B 254–53. Stainless Steel, Preparation of and Electroplating on
B 281–53 T. Copper and Copper-Base Alloys for Electroplating, Preparation of (Tentative)

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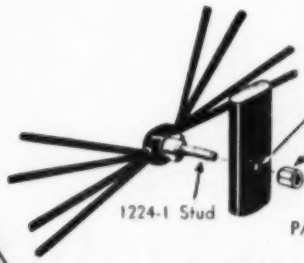

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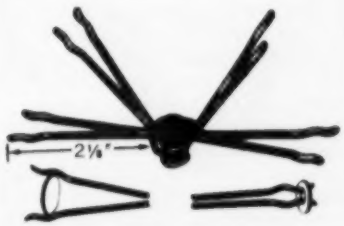
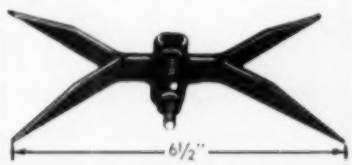
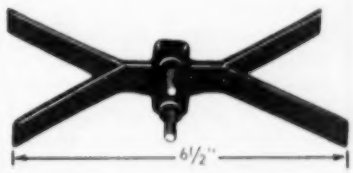


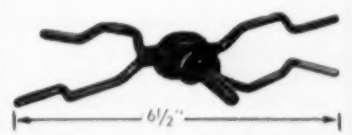
RS-207. Same design as the popular Style 1 Utility Tip. Has 8 prongs arranged in 4 pairs—formed to hold objects under spring tension from either inside or outside. Wire sizes: 1/16", .072" and .080". Universal Plastic Coated.



FS-102. Same design as the Style 4 Utility Tip, except has double knurler. 1/16" x 5/8" phosphor bronze. Universal Plastic Coated.



FS-101. Same design as Style 3 Utility Tip, except has double knurler. Excellent for racking objects that tend to wobble. Square ends are easily shaped when necessary. 1/16"x5/8" phosphor bronze. Universal Plastic Coated.



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Trade Literature

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L—400. New Le Roi Engine Catalog—Le Roi Division Westinghouse Air Brake Co., announced the publication of a colorful bulletin describing and illustrating the 115 to 410 horsepower Le Roi L3000, H2000, and F1500 engines.

The eight page three color bulletin uses cutaway views and photographs to show advanced features such as modern valve-in-head design. This design incorporates a more nearly perfect combustion chamber producing more horsepower per fuel dollar.

Some of the other features discussed include: Full length guided valve stem mechanisms, light-weight cam ground aluminum pistons, drop forged crankshafts with polished bearing surfaces, full flow oil filters, sectional water-cooled exhaust manifolds, large main bearings, full pressure lubrication, and conveniently located controls.

Basic specifications are also included along with map showing the location of factory branches and authorized distributors in the Le Roi national sales-service network. In addition to general industrial use, the engines are widely used in the oil, agricultural, and construction industries.

Horsepower

ΑΥΤΟΜΑΤΟΣΙΣ

THE GREEKS HAVE A WORD FOR IT

By Pericles, Georgios, Archimedes

Ours is a setup of which we want to be proud. Recently, we automatized the whole process and everything went along smoothly for a while. Then, suddenly and without warning, everything went awry:

The ACTION of the ANALOG COMPUTER causes ATTENUATION in the AUTOMATIC CONTROLLER and thereby throws off our AUTOMATION. We have investigated the mystery of the CAPACITY in relation to the CASCADE CONTROL within our CLOSED LOOPS and found that our COMPUTER was throwing off the CONTROL AGENT and misleading us as to our CONTROL MEANS. Therefore, our CONTROL POINT would not respond to our CONTROL SIGNAL. This was contrary to all theories of CYBERNETICS, of course.

We wondered if this could in any way be related to CYCLING, DAMPING, or merely our DATA HANDLING SYSTEM. It proved to be in the DEAD BAND which, of course, left us with DEAD TIME and explained some of the DEVIATION. We tried to investigate the DIAPHRAGM MOTOR VALVE to ascertain that our DIFFERENTIAL GAP was not caused by a DERIVATIVE ACTION.

When applying our DIGITAL COMPUTER, we were able to come up with DISCRETE UNITS that in some measure explain the DYNAMIC BEHAVIOR of our END-POINT CONTROL and point to a possibility of EQUILIBRIUM despite ERROR and FEEDBACK. On the other hand, our FINAL CONTROL ELEMENT responding to our FREQUENCY RESPONSE ANALYSIS, showed a GAIN on our GRAPHIC PANEL, which sent the whole system HUNTING and caused tremendous HYSTERESIS.

We checked our INPUT with a new INSTRUMENT and all our INSTRUMENTATION showed our INTEGRATOR to have a LAG in the LOAD which was not recorded by the LOGGER. Where then WAS OUR MANIPULATED VARIABLE? Our MEASURING MEANS obviously needed MINIATURIZATION and a NEUTRAL ZONE or two to overcome the NOISE OFFSET. We thought of an OPEN LOOP but felt that we could not reach OPTIMALIZATION with it.

When the OSCILLOGRAPH RECORDER couldn't catch up with the OUTPUT, we attempted to find a reason for the OVERSHOOT of the PHASE SHIFT with a POTENTIOMETER. After all, our PROGRAM CONTROL was all off and was throwing the PROCESS out of whack with our PROPORTIONAL BAND and our PROPORTIONAL CONTROL. Our PYROMETER could not record the RATE ACTION nor its RESISTANCE to RESET ACTION. We were faced with a problem of RESET RATE that resulted in an inability to REPRODUCIBILITY because the SCANNER had no SENSITIVITY and easily threw our SERVOMECHANISM at odds with all known facts of SERVOTECHNIQUES. We started a SET POINT setup with a new SIGNAL so that it wouldn't be bothered by SINUSOIDAL variations. However, the STATIC BEHAVIOR now showed on our STRAIN GAGE and that to achieve the proper STEP CHANGE a new SUPERVISORY CONTROL also had to be installed as well as more complicated SYSTEM ENGINEERING, employing TELEMETERING, THERMISTOR, THERMOCOUPLE and TRANSDUCER elements. Now, we hope that our TRANSFER FUNCTION will respond to TRANSISTOR control and do away with the TRANSIENT STATE caused by the ULTRASONICS VARIABLE apparently inherent in our setup.

Can you help us???

Let's Let M-H Explain

Many a businessman stands in awe of the engineering profession's accomplishments in today's atomic age, but is baffled by and a little impatient with the growth of "engineeringese" in our everyday language. Words like "sinusoidal," "reproducibility," "feedback," "optimalization" are bandied about these days by engineering-trained executives as though common terms, leaving the nontechnical folk nonplussed.

One firm, perhaps prompted by its corporate conscience, since its own automation engineers have contributed heavily to this polytechnical polyglot, decided to try and clear up some of the confusion. Surveying the technical terms most broadly used, the Brown Division of Minneapolis-Honeywell packaged them in a modest booklet with amazingly clear laymanlike definitions.

This little "Automation Dictionary" covers some 87 words and phrases, all of which had their origin with the engineers but are now creeping into the lexicon of today's modern businessman. **INDICATE L 401.**

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Trade Literature

L—402. Gold in Them Barrels—A new instructional booklet on barrel finishing has been released by the makers of "Honite" brand barrel finishing chips, compounds and equipment.

Called "There's Gold in Them Thar Barrels," the 10-page manual describes the basic steps involved in making trial processing runs, and makes recommendations for selection of media and compounds.

The publication also gives specific recommendations for barrel speeds, water level, time cycles and barrel loading; lists 11 "Honite" brand compounds and the specific uses of each; and explains "self-tumbling" or rolling.

L—403. Technological Uses of Hydrogen Peroxide Vapor—The interesting possibilities that exist for the technological use of hydrogen peroxide vapor and means of vapor generation are described in new Bulletin No. 62, available from the Becco Chemical Division, Food Machinery and Chemical Corporation.

Presented is a summary of information on hydrogen peroxide vapor illustrated by three tables and two graphs, as well as a bibliography on the subject.

The new bulletin is significant in that the bulk of published information deals with hydrogen peroxide in its liquid form. Relatively little is known about hydrogen peroxide in vapor form.

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Shelving, Storage and Jokes

L—404. Storage and Maintenance Equipment Catalog—A new catalog has been published by Precision Equipment Co. featuring steel shelving, lockers, as well as other storage and maintenance equipment for industrial and institutional use. It continues to feature, in the tradition of previous Precision catalogs, the work of nationally famous cartoonists. The catalog also contains the popular joke column entitled, "Heard in the Locker Room," which adds sparkle to Precision catalogs.

L—405. High Vacuum Pumps—Catalog No. 400, available from Kinney Manufacturing Division, The New York Air Brake Company, describes the new Kinney Model KMB mechanical booster high vacuum pumps.

The 4-page, 2-color bulletin describes the advantages of the two-stage construction. No sealing fluid is used in the first stage, producing a clean and fast pumping speed with low power consumption. Operating characteristics in metallurgical vacuum processing, metallized coating, foundry research and pharmaceutical applications are explained.

The text describes the ability of the unit to pump efficiently at pressures exceeding the stalling pressure of oil ejector and oil booster pumps, and to handle large gas bursts such as may occur in vacuum furnaces.

The pumps are two-stage units consisting of a rotary, positive displacement booster pump exhausting into the inlet of a Kinney single stage-duplex model cam and piston type high vacuum pump. The combined unit provides high volumetric and mechanical efficiency over a wide range of pressures.

A cutaway view is included, together with three performance curves which show

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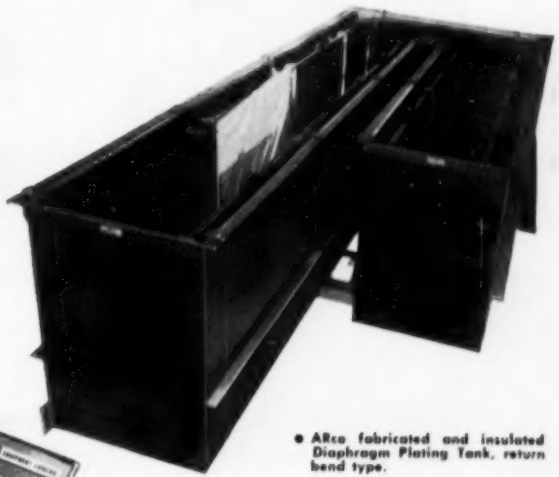

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Trade Literature

typical pumping speed, throughout, and horsepower vs inlet pressure.

Capacities, dimensions and weights of all Kinney high vacuum pumps are detailed in convenient tabular form. The bulletin also describes and pictures Kinney's line of bronze, cast iron and fabricated steel vacuum tight valves.

L—406. Plastic Pipe and Fittings Catalog—How to use and specify rigid plastic pipe and fittings is the subject of a new 12-page catalog of its standard line offered to design, maintenance and application engineers, by Alpha Plastics, Inc. Catalog is created to enable engineers to learn the modern uses for plastic pipe to keep their methods in step with product processing and maintenance improvements.

Catalog provides useful reference facts on its ½ in to 4 in line of normal impact (Alpha #101) and high impact (Alpha #103) unplasticized polyvinyl chloride pipe and fittings, plus properties and characteristics data, together with detailed drawings and specifications of solvent-type fittings plus the new, injection-molded threaded fittings.

Featured is a corrosion chart classifying more than 275 corrosives rated according to desirability of use with Alpha #101 and Alpha #103 piping. Recommended and non-recommended applications are shown, based on company tests, user reports and field experience.

L—407. Grades and Speeds for Cemented Carbide—Selecting the proper grade of cemented carbide for use as a cutting tool for a particular cutting job is as important as choosing the right machine to do the job, according to a new booklet issued by Carboloy Department of General Electric Company.

The 24-page publication, section 3A—"Selection of Carboloy Grades and Suggested Speeds," points out that proper understanding of various grades of carbides for cutting metals, fibers, plastics and rubber results in better finishes, greater accuracy and longer tool life.

Issued as a supplement to section 3 of Carboloy tool manual GT-191, the publication includes data for determining efficient cutting speeds for machining steel, cast iron and nonferrous materials, calculating machine horsepower, determining carbide grades by characteristics, selecting rake and relief angles of carbide tools, and handy reference tables covering speed and grade suggestions for cutting various materials. The supplement also includes latest speed and feed data on the new grades 350 and 370 carbides.

L—408. New Handbook Outlines Use of Alloy Steels—Available now for general distribution, a new 200-page handbook entitled "Alloy Steels Pay Off" is offered by the Climax Molybdenum Company to engineers, purchasing and management personnel who are interested in the practical utility of alloy steels in modern equipment design.

The Payoff

Highlighted in this book are the economic advantages of fabricating with alloy steels for improved weight-to-strength ratios in aircraft construction, bridges, electrical equipment, machinery, trucks and buses, etc.; longer life and less maintenance; heavier payloads and lower operating costs; improved safety and overall savings in freight and shipping costs. Advantages of high impact strength and shock-load resistance are discussed, as well as savings resulting from improved resistance to corrosion and wear.

In an industry-wide study, these economies resulting from alloy steel use are documented by more than 60 factual case histories presented in "Alloy Steels Pay Off."

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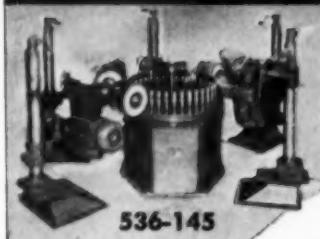
. . . cut costs on production finishing



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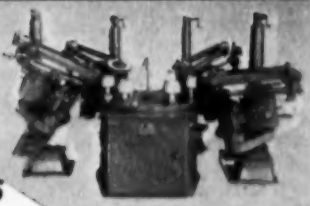

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ROTARY TABLES ARE AVAILABLE IN SIZES UP TO 24 FT. DIAMETER

534-337

ACME 8 FT. *Combination Type* ROTARY AUTOMATIC

● This machine can be readily changed from a 32 spindle continuous rotary automatic to an 8 station indexing rotary automatic by simple hand crank adjustment. Various types of ACME adjustable floating head polishing and buffing lathes are used including belt arm attachments on buffing heads, utilizing the same heads for buffing or belt operations. Spindle arrangements are available in multiples of 8.

Rotary Catalog on Request.

536-149

RECOMMENDATIONS and QUOTATIONS . . . will be offered on receipt of blue prints or preferably finished and unfinished parts you contemplate finishing, together with details of your present finishing operations and production requirements.

SPECIAL MACHINERY — AUTOMATIC BUFFING MACHINES

ACME *Manufacturing Co.*

Builders OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.

Trade Literature

L—409. Molybdenum Disulfide—Field Reports 136 and 138 covering typical particle sizes of molybdenum disulfide products and the lubrication of office machinery parts and sub-assemblies, are available from The Alpha Corporation.

Replete with illustrations, Field Report 136 shows in detail a few of the friction parts which one manufacturer of office machinery coats with Molykote during assembly.

Field Report 138 uses micro-photographs to show comparative particle sizes of various grades of Molykote lubricants.

L—410. Use of Colloidal Graphite in Engines and Machinery—A revised four-page bulletin containing photographs, diagrams, charts, and information on the advantages offered by colloidal graphite in the assembly and run-in of machines, has been released by Acheson Colloids Company. This bulletin shows how to use colloidal graphite, chiefly in the form of a petroleum oil dispersion. "Dag" Colloidal Graphite gives smoother bearing surfaces, increased power from reduced friction, lower bearing temperatures, reduced oil consumption, shorter run-in periods, protection against temporary failure of oil supply or rupture of oil film, less corrosion of cylinder walls and piston rings, fewer replacements, lower maintenance costs for bearings and friction surfaces, and longer useful operating life of engines and other machinery.

"Dag" Colloidal Graphite particles are microscopic and sub-microscopic in size. They possess identical polar charges, and therefore are mutually repelled and in uniform suspension. The extremely minute particles work right into the friction surfaces, forming a "graphoid" film. This is less liable to rupture than are films formed by conventional petroleum lubricants.

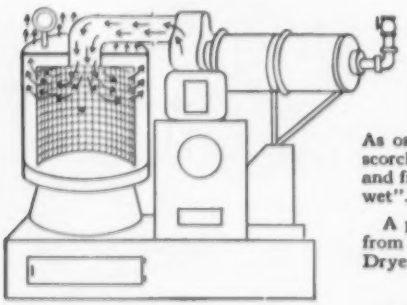
L—411. Rubber Lining Tanks, Valves Fittings—An illustrated, two-color, 8-page bulletin describing the advantages and application of rubber lining to steel tanks, drums, pipes, valves, fittings and pumps, is being offered by the Protective Coatings Division of Metalweld, Inc. Included in the bulletin are important tables giving the resistance characteristics of MW rubber lining to inorganic acids, salts and alkalies, organic materials and a wide group of miscellaneous materials. Details on the chemical, abrasive and temperature resistant qualities of rubber linings and the different types of linings available are also given. Metalweld's plant facilities for cementing, lining, and vulcanizing all types and sizes of equipment are illustrated, and the bonding process which joins rubber and steel together with a bond strength of over 500 psi, is described.

L—412. Airless Blasting Machine—A new bulletin on the 48 x 42 in Wheelabrator Tumblast, an airless blast cleaning machine employing the tumbling principle in conjunction with the hurling of metallic or non-metallic abrasives, has been published by American Wheelabrator & Equipment Corp.

The 48 x 42 in Tumblast has an operating load capacity of 17½ cu ft and is widely used in shops having a large production of sand castings, shell moldings, investment castings, forgings, heat treated parts, weldments, stampings, or other metal products requiring cleaning. The blasting compartment can hold hundreds of relatively large parts at one time. Deburring can be accomplished with steel parts, die castings, and other materials. Other applications include cleaning work in connection with reconditioning, like gas and water meters and automotive parts. Along this line is the surfacing of automotive brake shoes for bonding linings. Still other uses for it are the deflashing of plastics and the preparation of metallic parts for galvanizing, rubberizing, glass coating, painting, enameling, plasticizing. Metallic parts can be peened in it to increase their fatigue life. The bulletin makes mention also of the seven other sizes of the same type of machine, which make it adaptable to a wide range of cleaning requirements.

Individual sections of the bulletin are devoted to the following subjects: (1) a discussion of airless abrasive blasting in general; (2) the component parts of the Tumblast; (3) electrical, mechanical, and size specifications; (4) installation views of machines, plus photos of typical parts being processed in them; and (5) a set of case histories, giving actual performance data experienced by users of the Tumblast.

EVER BLOW INTO AN ASH TRAY?

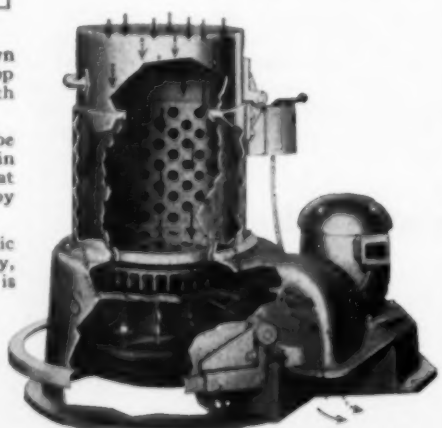


If you did, you saw a practical demonstration of the principle of air deflection. In old type dryers, air *blown* in from the top is deflected by the top layer of parts. As one user put it, "the top layer gets scorched, the next layer is nice and dry, and from there on down the parts are still wet".

A powerful suction fan *draws* the air from the bottom of the modern Nobles Dryer. Fresh air rushes in from the top to fill the vacuum and is drawn through the entire contents from top to bottom where it is expelled with the water.

Steam or electric heaters may be mounted compactly in the cover in contrast with space consuming, heat wasting, separate units connected by pipe.

An internal expanding, hydraulic brake stops the machine smoothly, and quickly. The "brake pedal" is a ring extending around the entire working area so that the machine can be stopped instantly from any working position. In the interest of faster drying and lower costs write today!



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has all these advantages

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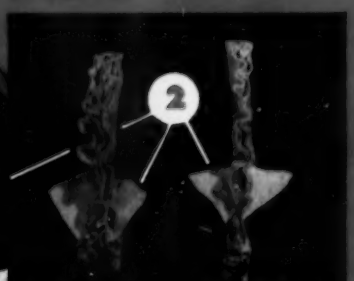
1. THICKNESS OF RING VARIES DENSITY
2. TRAILING ENDS — (Safety)
3. NON-COMPRESSIBLE CONSTRUCTION
4. NON-METALLIC CENTER — (No Shaft Scoring)



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ROCKLAND, MASSACHUSETTS

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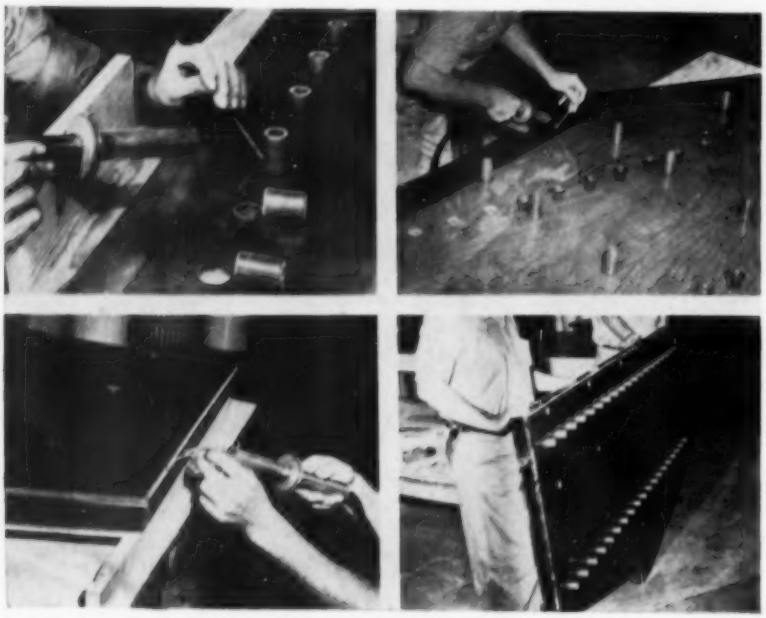
BRANCH OFFICES — PHILADELPHIA, DETROIT, LOS ANGELES, INDIANAPOLIS, GRAND RAPIDS

Equipment & Supplies

Please use Reader Service Card for all items in this section

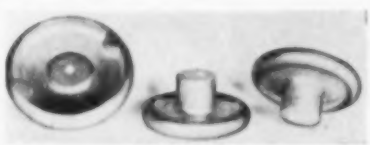


Tank Assembly Know-how

E—413. Assembly of parts machined of new Bakelite rigid polyvinyl chloride sheet to form a large, self-supporting electroplating tank began with the welding of nipple outlets into holes cut in one side sheet (top left photo). Made of extruded polyvinyl chloride rod with the core removed, the nipples were set flush with the inside surface of the tank side. They protrude from the outside surface to form one row of evenly spaced outlets near the top of the tank and another near the bottom. Spacer rods with plug-shape ends were welded into holes in the side sheet, to protrude from the inside surface. Narrow strips cut from Bakelite rigid polyvinyl chloride sheet laminated to a thickness of 1-¾ inches were then fillet welded to edges of the side sheet, forming bottom and ends of the tank (top right photo). The second side sheet of ⅜-inch laminated polyvinyl chloride sheet, cut to shape and drilled to hold the spacer rod ends, was then laid over the assembled part of the tank, where it was welded to the end and bottom strips (bottom left photo), and to the flush ends of the spacer rods. Turned into the correct position for use, the corrosion-resistant electroplating tank fabricated by American Agile Corporation, Maple Heights, Ohio, measures eight feet long, 44 inches high, 1-¾ inches wide inside, and 2½ inches wide outside (bottom right photo). Bakelite Company is producing both natural unpigmented and opaque rigid polyvinyl chloride sheet in thicknesses from .010 to .015 of an inch, in continuous rolls up to 51½ inches wide. Planished sheets measuring 20 by 50 inches are available up to 1-¾ inches thick, and larger planished sheets are available through custom laminators. Self-extinguishing like Bakelite vinyl copolymer sheet, the new Bakelite rigid polyvinyl chloride sheet has a higher heat distortion point of 160° F. This qualifies it for many new applications in military and electronic equipment.

E—414. Mass Produced Solid Disc Hand Wheels for use on jigs and fixtures for cranking shafts is announced by Jergens Tool Specialty Co., Cleveland, Ohio.

According to the manufacturer, these new hand wheels were developed to fill a need for mass produced wheels to eliminate custom making. Available in 4 inch and 5 inch sizes, these new wheels are made of aluminum alloy and feature a



Little Wheels

finished O.D. with boss faced off and spot centered. The new wheels are designed for easy attachment of revolving hand wheels.

E—415. New Pressure-Cooled Buff—United Buff Products Corporation of Passaic, N. J., announces a new pressure-cooled buff made of a new improved heavyweight cloth. This buff has been developed by United Buff in conjunction with a textile mill and laboratory. It is being sold at the same price as the customary buff. The efficiency and life of this new buff is anywhere from 10 per cent to 40 per cent greater, depending upon application.

Changes have been made in cloth construction and in cotton fiber content. Because of the special cloth mixture, it holds the buffing compounds more securely, enabling the compound to do a better and longer cutting job. The compound also adheres more readily to the buff and does not fly off. It offers much greater resilient backing to the cutting edge of the buff, so that greater pressure may be applied without losing flexibility. Demonstration given on request. For further information, write for name of local distributor.

E—416. A new nonmetallic, dustless blast-cleaning agent, said to permit substantial savings in production time, material cost, and blasting-equipment maintenance, as compared to sand and metallic shot, has been announced by the Baldwin-

No Dust

Hill Company, Trenton, N. J. Called Mono-Kleen, the spherical mineral shot blast cleans uniformly in one pass with no dust clouding the operator's vision and leaving the surface free of grime, film and dust.

Experience with Mono-Kleen shot in foundries, aircraft companies, metalworking plants and other industries has shown that blast-cleaning time can be reduced as much as 50 per cent with one-third less material, as compared to sand.

The mineral shot can be reclaimed and reprocessed for use again. Its original cost is only slightly higher than sand and is appreciably less than metallic shot.

Equipment & Supplies

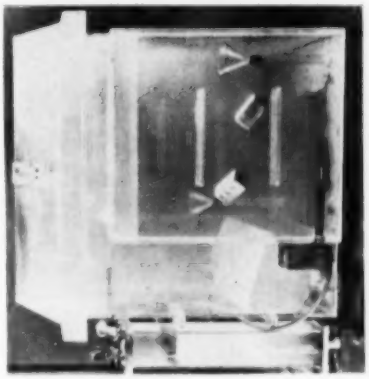
E—417. Bench Model Abrasive Belt Backstand. The model 524 has been added to the line of backstands offered by Hammond of Kalamazoo.

The newest addition to the Hammond line will quickly convert your present grinder or polisher into a modern, fast cutting, time saving abrasive belt machine.

The Model 524 is designed for production work on light polishing or deburring operations. Belts up to 4 inches wide can be used. Mounting bracket for floor or wall mounting is available to facilitate easy installation. Extension controls for tracking and tensioning can be furnished so adjustments can be made at the operator's working position.

E—418. The General Nuclear Corp. has announced the availability of germanium rectifiers along with the latest in selenium rectifiers. They will continue to market products which are applicable to electro-finishing and will next bring out a line of instruments and controls on which final production designs are now being concluded.

E—419. For the first time, clearer, "picture-window" visability during tests is made possible by the insulating effect of flat-panel "H-T Sincolite" water-jackets housing the 2 new electric heaters located front and rear on the outside of the cabinet. Progress of tests can be observed through these water-jacket "picture windows" without opening lid, interrupting the process or handling specimens. This offers a special advantage in short tests of black oxide finishes and other less-protective coatings.



See-worthy

More uniform temperatures are maintained throughout. Danger of "hot bottom" is eliminated which would ordinarily cause vaporizing of contaminated condensate on the cabinet floor.

According to the manufacturer, these new accuracy-factors are enabling users to claim "all test results within 10 per cent of absolute duplication." For operating convenience, all controls are now located at the left end.

The new Singleton Cabinet is built to meet all existing A.S.T.M. and U.S. Government Specifications for this type of equipment.

E—420 New Filter Removes All Traces of Liquid or Solid Contamination—An economical filter-unit designed to remove all traces of liquid or solid particles contaminating a gas was announced by Charles Engelhard, Inc. The low back pressure of this filter-unit is astonishing, and its effectiveness is demonstrated by its ability to extract all traces of cigarette smoke.

The efficiency of the filter does not diminish as the surface is contaminated with filtered particles. Any cracks or breaks in the filter material will destroy its effectiveness. A check can be easily made with cigarette smoke to determine if there are any breaks.

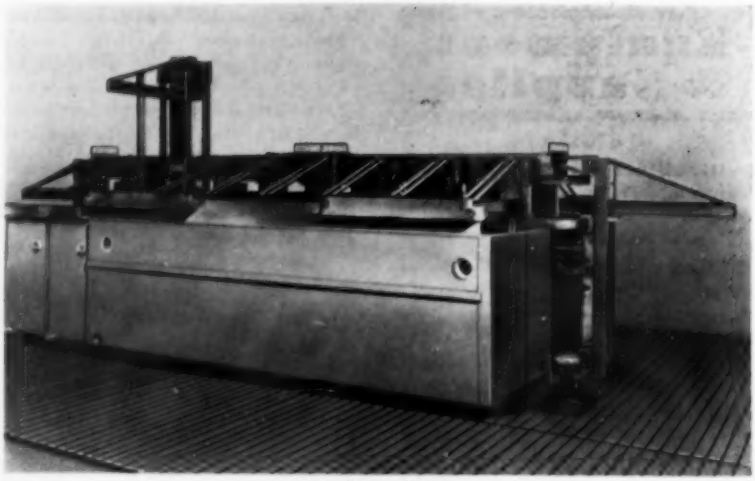
The filter is not affected by the direction of flow. This new filter, because of its efficiency, has numerous potentials other than filtering samples of gases for instruments.

Equipment & Supplies

E—421. Details of the new **Stevens "Stevadoer" Automatic Heavy-Duty Plating and Processing Machine** designed to complement the existing Stevens line of automatic plating and processing equipment are now available.

This new side arm type machine was engineered around an "automation concept" that will enable automatic loading and unloading. It can be adapted to single or double row plating and processing and was designed to handle almost unlimited rack sizes and extreme weights. However, only a minimum amount of height and floor space is required.

The Stevens-pioneered delayed set-down mechanism which provides independent timing in one or more tanks can be provided. The "Stevadoer" is mechanically flexible—additional transfers can be easily provided. Through the use of a special timer control, a carrier arm can be made to skip any particular tank or operation as desired.



The "Stevadoer"

Safety and accessibility combined are added features. A 20-inch or wider cat walk can be provided between processing tanks and the mechanism on two-row machines. This permits safe and easy addition and removal of anodes, lubrication and inspections. No moving mechanism is over the solutions and all internal mechanisms are built below tank level. As a result, contamination of solutions from excessive lubrication and metallic wear is eliminated. Likewise damage resulting from corrosive fumes is reduced since moving parts are not in areas subject to attack.

Wide Walk

All lift and horizontal motion of the new "Stevadoer" is accomplished by hydraulic power. Special controls permit independent adjustment of acceleration and transfer speeds to accommodate all extremes of weight and rack size.

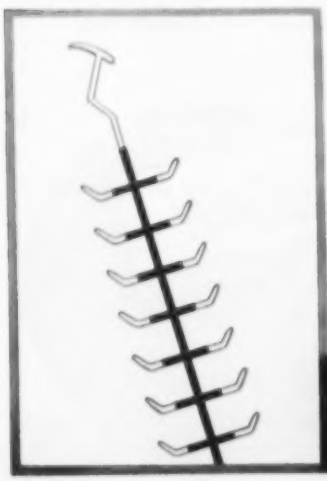
4 is a better "Point" than 7

when you're playing with

RACK COATINGS

It just isn't natural to make a point of dipping a rack seven times to get a coating thickness of 20 mils — when you can do it with four!

New Tygon Air-Dry Rack Coating 277 builds a film thickness of five mils per dip. This new "higher-solids-content" coating cuts rack maintenance costs way down — saves by cutting rack handling time almost in half — saves by cutting "down-time" for rack recoating — saves by increasing plating cycles per rack.



PLACE A TRIAL ORDER TODAY

See for yourself why electroplaters who have tried Tygon 277, say — "the finest rack coating we've ever used." 275-D

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AKRON 9, OHIO
PLASTICS AND SYNTHETICS DIV.

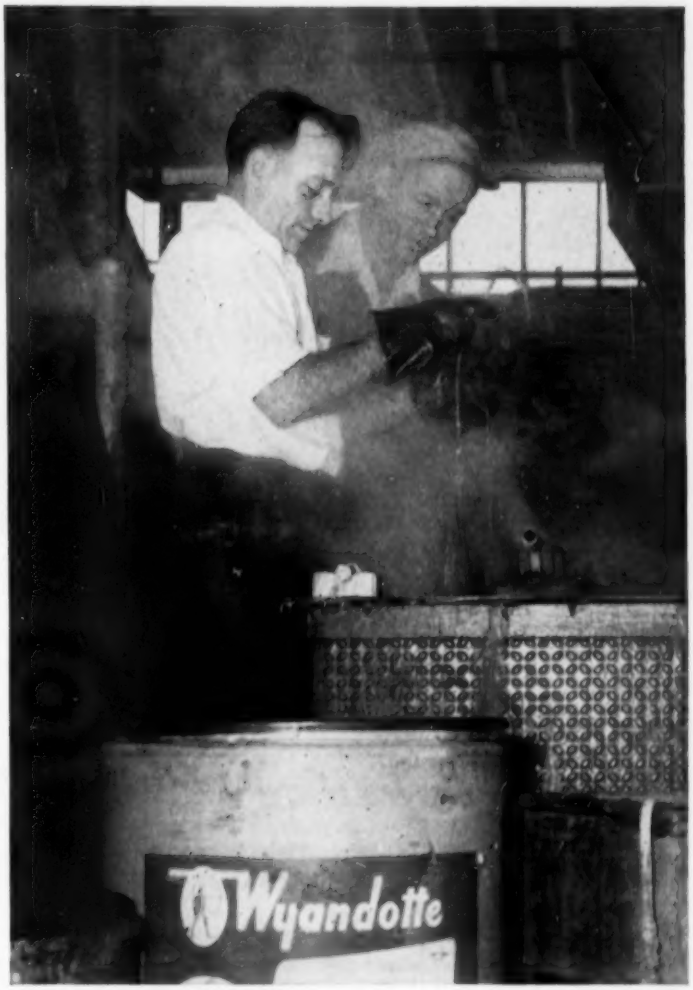
Wyandotte metal cleaners lick job shop's cleaning problems

Any plating operation, large or small, is faced with the problems of keeping production costs down, quality up. The Reliable Plating Corporation, Chicago, Illinois, uses Wyandotte metal cleaners, to help solve these problems, in a variety of standard job-shop applications. Says President J. Robert Greenwell: "Wyandotte Chemicals have done an excellent job for us for over fifteen years. We consider Wyandotte products the answer to job-shop cleaning problems."

Reliable Plating Corporation uses Wyandotte B.N. and C.S.R. for electrocleaning; Wyandotte W.L.G. for soak cleaning; Wyandotte 321 and Burnek 22 for barrel finishing. In each instance, Reliable reports: excellent cleaning and finishing; increased production through elimination of rejects; savings due to long solution life of chemicals; *definitely lower use-cost!*

Wyandotte B.N. is a superior, versatile electrocleaner for nonferrous, as well as ferrous metals. C.S.R.* is a unique reverse-current electrocleaner for removing smut from steel. W.L.G.* is outstanding for heavy-duty soak cleaning; removes even toughest soil deposits. Wyandotte 321, a soap-type compound, and versatile, economical Burnek 22 are excellent for ball-burnishing applications.

For research-developed and production-proved products that will improve the quality of your cleaning, and reduce operating costs, call your Wyandotte representative, now! *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, Calif.* *REG. U.S. PAT. OFF.



Soak-cleaning operation at Reliable Plating Corp., Chicago, Illinois, is checked by Vice President Joseph B. Becker (right).

● *President J. Robert Greenwell, of Reliable Plating Corp., is also president of the National Federation of Metal Finishers; was chairman of the Chicago Electro-Platers Institute for two terms.*

Wyandotte CHEMICALS

Helpful service representatives in 158 cities in the U. S. and Canada

Largest manufacturers of specialized cleaning products for business and industry

Get your anodes from one source

Federated Metals has them all:

Lead (including our famous Conducta-Core anode)	
Cadmium	Copper
Zinc	Tin
Brass	Tin-Lead

All conventional sizes and shapes can be supplied. Good service, too, from specialized distributors in your area.

Write for complete 8-page color catalog which gives full data on all anodes in the Federated line. A worthwhile reference piece.

Photo courtesy U. S. Metals Coatings Co., Inc., Elizabeth, N. J.

Federated Metals Division

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Equipment & Supplies

E—422. A New Hot Spray Vinyl Paint that Builds 3 Mil Thick Film in One Coat has just been announced by The U. S. Stoneware Co., Akron, Ohio.

The new coating—Tygon ATD—combines vinyl and other plastic resins to form a high solids content viscous material that reverts to a liquid form on the application of heat, thus avoiding the use of excessive amounts of solvents to achieve spraying consistency.

It's Hot

Tygon ATD is brought to a temperature of approximately 160° F in a standard paint heater. An air pressure of 20 lbs. forces the heated paint to the spray gun where it is atomized by 50 lbs of air. As the hot paint leaves the spray gun most of the incorporated solvents are evaporated and a thick, high solids content film is deposited on the target. Since but little solvent remains in the film, drying is remarkably quick.

Tygon ATD Hot Spray Paint is resistant to the attack of most commercially used acids and alkalies, as well as to alcohols, water and oils. It is, however, attacked by aromatic hydro-carbons, ketones and esters.

E—423. Movable Vacuum Pump—The new VacForm mobile pump wagon manufactured by Vacuum Forming Corp., N. Y., can be moved to the point of installation, connected via a heavy-duty hose to equipment used in any of hundreds of vacuum applications and begin push-button operation as soon as it is plugged into an ordinary electrical outlet. Termed the first movable vacuum pump unit now available, it is mounted on a heavy steel frame with a swing-back top-door opening, rubber-tired ball-bearing wheels with swivel casters and locks, start-and-stop push-button controls and varying electrical requirements. The unit includes an air-cooled rotary pump with an adjustable vacuum shut-off switch, a 50-gallon welded surge tank with bottom drain, thermal overload protection and an exhaust filter.

New SCHAFFNER BIAS buffs

give more mileage . . .

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- . . . FULLY VENTILATED
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MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS.

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CENTER SIZE _____ ARBOR _____
PLY _____ COUNT _____
NORMALLY I USE _____ SECTIONS PER MONTH _____
NAME _____ TITLE _____
COMPANY _____ STREET _____
CITY _____ ZONE _____ STATE _____

SCHAFFNER AIR-COOLED METAL-CENTER BUFFS ARE PRICED RIGHT • PRODUCED IN ALL DIAMETERS, CENTERS, PLYS AND COUNTS

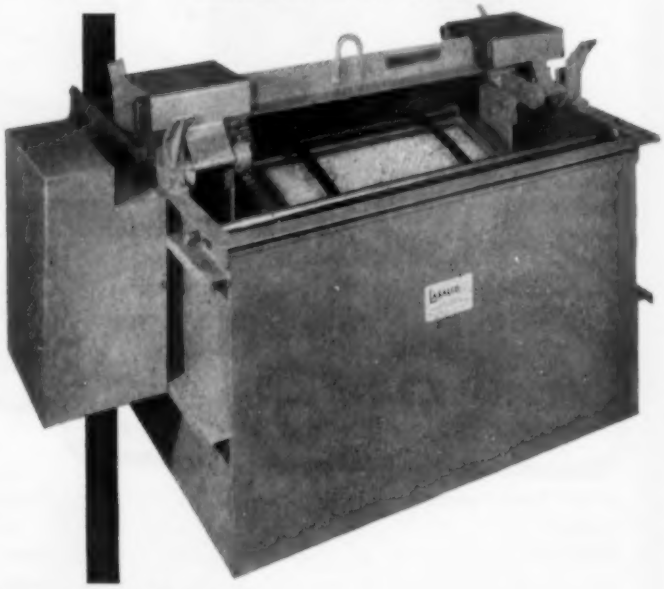
Does The Complete Plating Job In A Single Cylinder!

HIGH TEMPERATURE LUCITE CYLINDER

Lucite cylinder on Lasalco's loading stand equipped with loading hopper

- Eliminates work transfers—carries the work from start to finish—speeds up plating operations—lowers production and equipment costs
- Remains impervious to all usual plating solutions
- Lasts indefinitely when used in temperatures up to 170°
- Full length 1-piece negative connection gives perfect contact. Heavy dangler imbedded in load
- Negative contact can be arranged to carry up to 800 amps
- Quick, unobstructed loading and unloading. One-piece door has instantly removable positive-locking clamps
- Rugged construction of ½" thick Lucite. Annealing after assembly preventa all internal stress
- Capacity up to 150 pounds

Cylinders available in 24", 30", 36" and 42" lengths. Inside diameters 12" or 14" across flats.



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with LUCITE CYLINDER

- Knife switch contacts are entirely self-cleaning when cylinder is lowered into place.
- Cylinder knife switches insulated and protected by guard from overhead drippage.
- Multiple units for tackle hoist operation. Single units either tackle or hand hoist.
- Motor-driven gear drive has 3-speed selector for 2-4 and 6 r.p.m.
- Nothing plates but the load! A real money-maker that does a better job in less time at lower cost.

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Faster Lower Cost Buffing

on the new

Sunbeam

RADIANT CONTROL

TOASTER

This new SUNBEAM TOASTER is "Automatic Beyond Belief" . . . it's faster . . . saves a housewife's time. It minimizes her efforts. She just drops the slices in the slots and lets the Sunbeam take over.

The idea of Automatic Operation has its place, too, in the finishing production line . . . as at Sunbeam where they use the well-known spray buffing compound, Lea Liquabrade, in an automatic spray buffing step on copper plated steel before bright nickel plating. Using Liquabrade increases buff life and saves compound by eliminating nebbins. Production is faster and cleaner. Cleaning costs are reduced because emulsifying properties of Liquabrade binders simplify cleaning procedures.

Lea Liquabrade is manufactured with high quality ingredients. Uniformity of binders and abrasive grain sizes for all grades are closely controlled by our laboratory. Using the Lea Liquabrade Method of Spray Buffing, in place of bar buffing compound, will give you maximum savings and a better finish.

If you're already set up for liquid spray buffing, we'll be glad to send you working samples of Lea Liquabrade. Just tell us what your finishing operations are and what metals are being buffed. Our laboratory will evaluate this data and recommend the proper Liquabrade buffing compounds for your use.

If you're using bar buffing compounds, write us in detail and we'll be glad to outline the savings to be made by shifting over to the Liquabrade Method of Spray Buffing.

Our objective is to help you save money on your metal finishing operations.

*Grades available for: Steel, Stainless Steel, Die Castings, Aluminum, Brass, Copper, Nickel Plate, Plastics.

Burring, Buffing, Polishing, Lapping, Plating and Spray Finishing . . . Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions.

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Are you interested in Plating Specialties? SEE THE QUICK SPOT AT THE BACK OF THIS BOOK!

Lea-Ronal

points the way toward MORE ECONOMICAL and SUPERIOR high speed 'bright' finishes for the silver plater . . .

STILL or BARREL PLATING

If you are silver plating articles such as those illustrated, for either decorative or industrial use, you should investigate the Lea-Ronal Bright Silver Process. Full scale production in numerous shops is proving:

LOWER COSTS because deposits are 'bright' as they come from the bath, scratch brushing can be completely eliminated; also coloring in many cases.

LOWER COSTS because plating time is reduced as a result of the high current density (0-60 ASF Hull Cell) used in normal operations. You get more work from existing equipment. Extra floor space and equipment are not needed for increased production schedules.

LOWER COSTS because operations are at room temperatures.

LOWER COSTS because AgCN additions are reduced to a minimum — in fact, may be completely eliminated with proper operations.

SUPERIOR PLATING because deposits are harder than deposits from conventional cyanide baths yet retain desirable ductility. Thus, they have greater wear resistance without sacrificing ductility.

SUPERIOR PLATING because the process can operate with extra high current densities (see above) for the production of extra heavy deposits, as for bearings.

SUPERIOR PLATING because solutions are crystal clear, work is completely visible at all times. Better visual control.

SUPERIOR PLATING because silver deposits from Lea-Ronal Bright Silver have better tarnish resistance than those from conventional plating baths.

And back of all this is the service of the experienced Lea-Ronal Technical Staff ready at all times to help you improve not only your silver plating as outlined above but copper, nickel and gold industrial and decorative plating as well.

The LEA GROUP
serving the Finishing Field
Lea-Ronal, Inc., Long Island City, N. Y.
Lea-Michigan, Inc., Detroit
The Lea Mfg. Co., Waterbury, Conn.
Lea Mfg. Co., of Canada, Toronto
Plating Polishing Buffing Burring

Lea-Rona!

L·R

Main Office and Laboratory:
42-48 27th Street, Long Island City 1, N. Y.

Sales and Manufacturing Plant:
237 East Aurora Street, Waterbury 20, Conn.

SEE OTHER SIDE OF THIS INSERT

BENEFIT FROM

McGean Bright Nickel

Use a bright nickel solution
designed to provide
continuous operation with
infrequent need
for purification . . .

OBTAIN

brighter deposits
superior bright throwing power

WITH THESE FEATURES . . .

- simple control
- low cost
- infrequent bath treatment

The McGean Chemical Company • 1040 Midland Building • Cleveland 15, Ohio

dependable manufacturers of anodes and plating chemicals

McGEAN

THIS SERVICE WAS DESIGNED FOR YOU

A lot of profits can roll out the back door of your plating shop if you fail to keep up-to-date on prices of the hundreds of items you use every day. That is why Udylite, as another of its many free services to electroplaters, publishes the Price Guide—a monthly price listing of important items regularly used by the trade, as well as information about new developments in equipment and processes.

It pays to buy supplies from Udylite—you can be sure of top quality, accurate weight and pricing—that Udylite stands back of every sale. You can be sure of prompt delivery too, as Udylite has widespread warehousing service.

The Udylite Price Guide has become an important tool for thousands of electroplaters. If you are not receiving your copy now, send us your name and address and it will soon reach your desk on the first of each month.

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

WORLD'S LARGEST PLATING SUPPLIER

Equipment & Supplies

E—424. The Wiretex Manufacturing Co., Inc., Bridgeport, Conn., has produced a stainless steel basket and sling combination to carry metal parts into a Lindberg Cyclone annealing furnace operating at temperatures up to 1380° F. Four baskets are nested in the sling, and a self-locking lift bar holds them securely in place.

Combination Carrier

The baskets are 22 inches O.D. by 6½ inches deep, and are constructed of wire mesh reinforced with ½ inch diameter rod. They are equipped with lifting hooks and bottom braces.

The sling is made of ¾ inch diameter rod, and is equipped with lifting hooks and standing lugs. It unfolds easily to allow the baskets to be inserted and removed with a minimum of lifting.

E—425. A new hacksaw, called Padhacksaw, has been designed so that cuts of unlimited lengths and design can be made.

Without the cumbersome, conventional hacksaw frame, the high chrome finished Padhacksaw, can therefore be used in close quarters and for dozens of cutting jobs.

Spring action makes the saw semi-automatic and thus saves time and effort on the part of the user. Padhacksaw performs jobs normally done by many tools such as the ordinary hacksaw, jigsaw, keyhole saw, padsaw, corrugated iron saw, pipe cutters, shears, etc.

Equipment & Supplies

E—426. Walker Selenium Rectifiers—The Walker Division, Norma-Hoffmann Bearings Corp., Stamford, Conn., announce a new line of selenium rectifiers for electroplating and anodizing.

Self-Contained

They are available in two types—basic rectifiers deliver the voltage and current stamped on the name plate but have no controls. Self-contained rectifiers incorporate the basic unit with voltage controls and include instruments, all within single cabinet. Oversized components are used throughout. Copper bus bars with low current density are used.

In addition, a remote control unit is available for use with the basic rectifier. This control may be mounted at a location distant from the basic rectifier for convenience of operation.

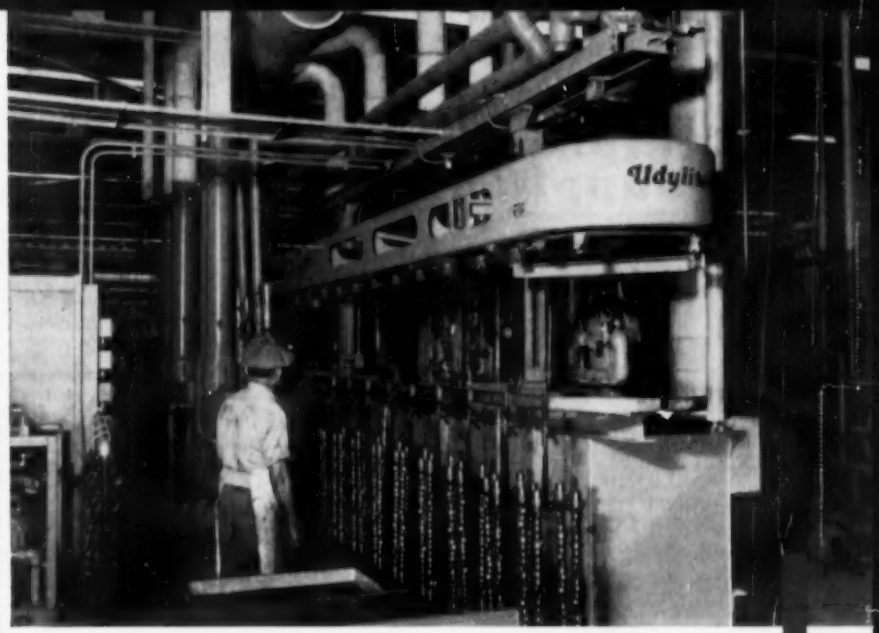
All Walker selenium rectifiers have a power factor of 95 per cent and a d-c ripple of approximately 4 per cent. A lower ripple content is available on request.

E—427. A new Ohio Tramrail trolley design developed for low headroom situations, and available for use with chain blocks, electric hoists and special applications has been announced by The Forker Corporation, Cleveland, Ohio. In effect, the new design enables the chain block or electric hoist to be "built-in" rather than hook-suspended from the trolley.

Clearance between trolley load-bar and track has been reduced to ½ inch, while a special cross-head pin arrangement enables the trolley load-bar to directly support the hoist unit, eliminating the space lost with the conventional top hook. As a result, for the one-ton chain hoist, distance from track flange to the hook in uppermost position is 15 inches, representing a headroom savings of approximately ½-foot.

E—428. New Lab Glassware—Doerr Glass Company will manufacture and merchandise a line of branded laboratory glassware, it was announced recently by F. J. Doerr, the company's sales head.

The new branded ware will be known as the Diamond D Blue Line.



ASK THE COMPANY WHO OWNS THEM

New Packard Plant Uses Three Udylite Plating Machines in Modern, Efficient Manufacturing Lines

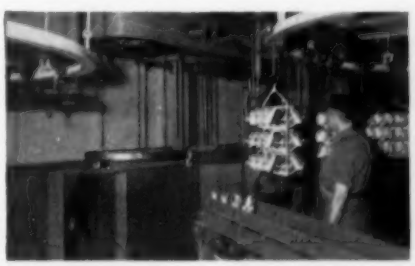
At the Packard Motor Car Company's new, modern Utica, Michigan plant, three Udylite Junior Full Automatic metal finishing machines are processing parts on three feeder lines that deliver components to the final assembly line. The machines are placed right in the flow of work without the necessity of a special plating room.

These Udylite machines are used for Lubrite of camshafts (above); tin plating pistons (lower left); and anodizing of miscellaneus parts (lower right).

The Udylite Junior Full Automatic is ideal for any production line. There is no need of moving parts from a line to a remote plating department and then back to the line.

The Udylite Junior will give you high production capacity with a minimum of floor space. It's portable—easily moved when you change your plant layout. But best of all, its cost is low.

A Udylite Junior Full Automatic may be the answer to your factory automation problem. Let us tell you more about it.



WORLD'S LARGEST PLATING SUPPLIER

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

Equipment & Supplies

Hot Reflector

E—429. An aluminum-coated fabric—for use in protective garments for industrial "hot jobs"—is now being manufactured by Minnesota Mining and Manufacturing Co., St. Paul, Minn.

Protecting the wearer by reflecting radiant heat—instead of insulating against it—the new material is flexible and weighs half as much as other protective fabrics giving the wearer more freedom to work.

A thin aluminum coating is applied on a light asbestos fabric base. Future plans call for manufacturing other types of aluminized fabric as well.

Garments made of the heat-reflective material such as the one pictured above have undergone field tests for two years by workers in foundries and steel plants, fire fighters and others who work in close proximity to intense heat.

Field tests showed that the new aluminum-coated fabric gives workers better protection, allowing them to work in the heat for longer periods of time; molten splatter rolls off the garment instead of collecting and adding weight; it wears longer than other protective materials; it has been accepted by "hot job" workers because of the freedom it allows.

According to the manufacturer men wearing face shields, aprons and spats of the aluminized fabric can change doors on a furnace operating at 2100 degrees Fahrenheit.

E—430. High Efficiency Rinse Tank for Barrel Plating—The many benefits of clean fresh rinse water are made practical by a round bottom tank for plating barrels with automatic feed valve and quick-acting dump valve developed by Belke Mfg. Co.

With square bottom tanks and fresh water continuously flowing in, the rinse water never gets clean. The contamination is merely diluted. Flowing through as much as a whole tankful of water removes only half the dirt.

With the new high efficiency tank, the fresh water is shut off and the contaminated water is dumped with the quick acting valve. When the cylinder comes in place the tank quickly refills with fresh clean water. This round bottom means less water to dump, with quicker refill. Complete rinse water change with the improved tank uses much less water and is faster than conventional square tanks with continuous fresh water feed.

Featherweight Welder

E—431. A light, 14-ounce electric hot gas welding gun for plastics of the thermoplastic group is being marketed by the Seelye Craftsmen Industrial Plastics Division, Minneapolis, Minn.

This equipment operates on 110 volts with a choice of 180 watt, 240 watt or 320 watt elements. The welding medium usually is electrically heated compressed air, although for some purposes nitrogen or carbon dioxide is used. An accurate valve controls temperature.

The greatly increased use of rigid polyvinyl chloride and polyethylene for corrosion resistant structures and piping have created the requirements for an easily handled, fast welding gun.

THE ANSWER TO YOUR TANK HEATING PROBLEMS

FOR ACID HEATING JOBS

G SERIES
FUSED QUARTZ
IMMERSION HEATERS

Over 40,000 CLEPCO Fused Quartz Heaters now in service.

Dependable, controlled heat at low operating cost.

Wide range of Standard Sizes for every need.

Only Fused Quartz Heater recommended and sold by all leading plating supply houses.

FOR ALKALINE HEATING JOBS

W & WS SERIES
STEEL AND STAINLESS
IMMERSION HEATERS

Specify CLEPCO Non-Magnetic Stainless Steel Heaters for your alkaline electro cleaners and bright copper plating tanks.

Specify CLEPCO Steel Heaters for all other alkaline tanks.

All leading Plating Supply Houses can furnish from stock.

SEE YOUR PLATING SUPPLY HOUSE

Clepco

CLEPCO

WRITE US FOR LITERATURE

CLEVELAND PROCESS COMPANY

1965 EAST 57th STREET

CLEVELAND 3, OHIO

a copper-tin plate with a choice of three compositions for beautiful color

20 — **GOLDEN YELLOW**
a rich golden plate

10 — **BRONZE RED**
a deep bronze red

45 — **SILVER WHITE**
of sterling appearance

Finish extra value into your products with any one of three colors that give a bonus of beauty along with longer metal life. Lustralite 20, 10, and 45 give you this color advantage with technical simplicity. Any of the distributors below will tell you why and how.

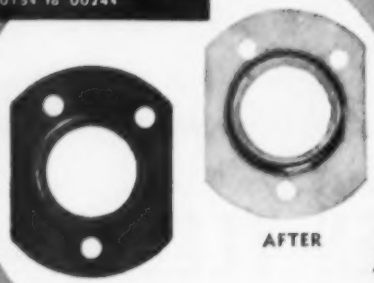
These distributors are fully equipped to advise you about LUSTRALITE and other Battelle-developed processes described in the new folder, "FINISHING — WITH A PROFIT"

- **The Enequist Chemical Co.**
  100 Varick Ave.
  Brooklyn 37, N. Y.
- **P. B. Gast and Sons**
  1515 Madison Ave., S. E.
  Grand Rapids 7, Mich.
- **The Globe Chemical Co.**
  Murray Rd. at Big Four R.R.
  Cincinnati 17, Ohio
  967 Deeds Avenue
  Dayton 4, Ohio
  705 North 15th Street
  Louisville, Ky.
- **Hydrite Chemical Co.**
  605-621 South 12th St.
  Milwaukee 4, Wisc.
- **G. S. Robins and Co.**
  136 Chouteau Avenue
  St. Louis 2, Mo.
- **Scobell Chemical Co., Inc.**
  Rockwood Place
  Rochester, N. Y.

Authorized Distributors for THE BATTELLE DEVELOPMENT CORPORATION • COLUMBUS 1, OHIO

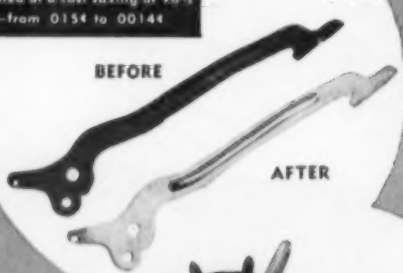
ALMCO Supersheen

Supersheen Barrell Finishing saved 84% finishing costs on this appliance part—from 015¢ to 00244

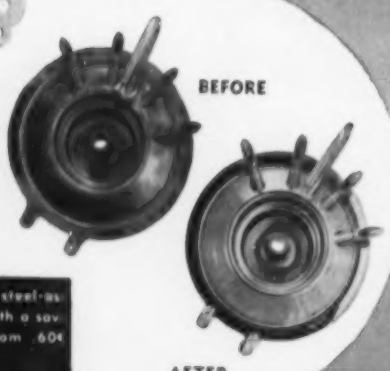


Machinery manufacturer reduced finishing costs 99.4% on this part—from .054¢ to 0003¢ per piece.

Case hardened stamping descaled, deburred and burnished at a cost saving of 90% —from 015¢ to 0014¢



Intricate stainless steel assembly finished with a saving of 90% — from .60¢ to .04¢.



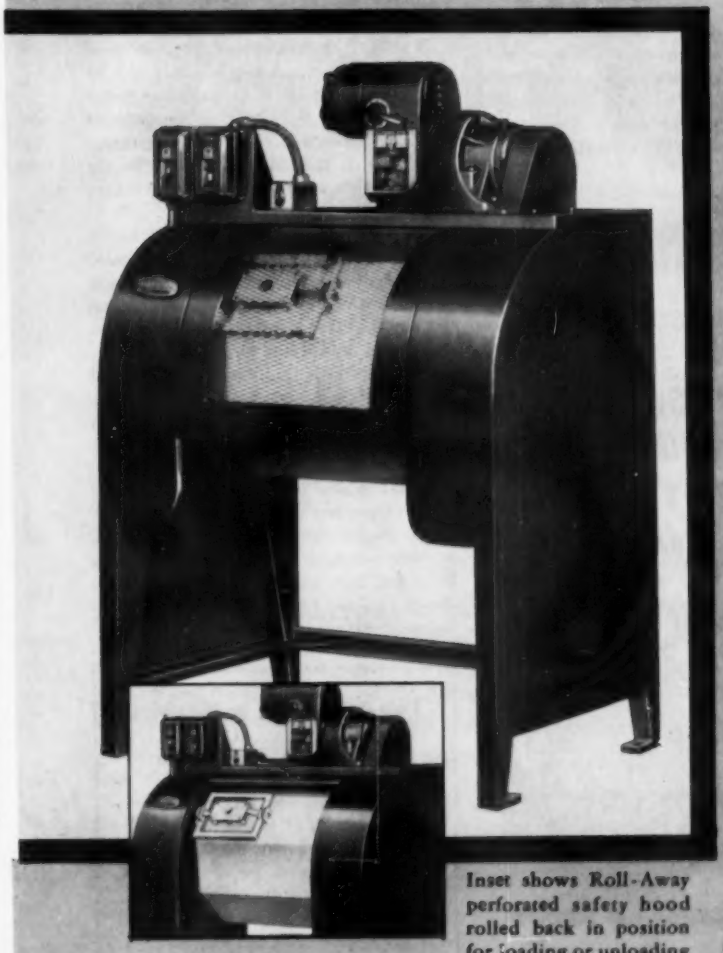
Documented *Barrel Finishing Production Runs* Establish Dollars & Cents Cost Savings up to 95%

WHY WAIT LONGER TO CUT YOUR DEBURRING AND FINISHING COSTS?

If you produce parts of any kind that require finishing, why not get the facts today on how Supersheen provides a better finish faster — at less cost with increased production.

Literally hundreds of case histories show almost unbelieveable savings when Supersheen Speed Finishing supercedes older outdated methods. We will provide engineering and cost data from actual test runs under actual shop conditions of your parts at no cost or obligation to you. Send the coupon right away for details of this amazing Free finishing service.

Speed Finishing



Inset shows Roll-Away perforated safety hood rolled back in position for loading or unloading

AMERICA'S LEADING AND MOST COMPLETE LINE OF BARREL FINISHING EQUIPMENT MATERIALS AND COMPOUNDS

MODEL DB-50

Featuring Compactness and Advanced Engineering Design

For processing small and medium size lots of parts. The new compact Model DB-50 now has been designed to include ALL THE ADVANTAGES of larger models but with SMALLER CAPACITY. Its 24" long by 22" diameter drum allows the processing of fairly large parts and in large quantities. It will usually be found that this size machine will save a great deal of capacity normally taken up in the larger unit. All barrel finishing operations can be performed in this machine including grinding, deburring, descaling, polishing and cleaning.

SPECIFICATIONS

Length—44-⅜", Width—32-¼", Height—69-⅛"
Barrel Size — 22" in diameter by 24" long
Number of Compartments — one or two
Total Barrel Capacity — 5.6 cu. ft.
Barrel Speeds — variable, 10 to 30 RPM

ALMCO Supersheen SPEED FINISHING ALBERT LEA, MINN.

FREE

52 Fact-filled Pages

Scores of Before & After Pictures

MAIL COUPON TODAY. LEARN HOW SUPERSHEEN BARREL FINISHING MACHINES CAN SAVE YOU BIG MONEY. See the latest on new equipment and compounds.

☐ Please send me Almco Supersheen Catalog.

☐ Send me name of nearest Almco Sales Engineer

ALMCO SUPERSHEEN — Albert Lea, Minnesota
914D Marshall Street

Name _____

Company _____

Address _____

City _____ State _____

Cover Story

CHIAROSCURO—A Study In Black and White

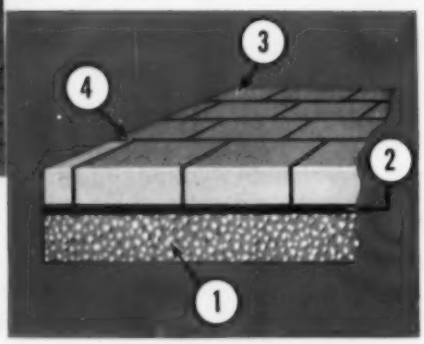
It is difficult to catch the subtleties of light and shadow on plated surfaces. Sometimes, almost inadvertently, a photograph captures these nuances. In the case of our cover picture for this month an obvious success is scored that leaves us wondering at the winking and sparkling lights and shades. The more one looks the less chaotic the picture becomes; the more one looks the more fascinating are the multitudinous details that seem to rise from the scramble.

It is one of the best pictures we have ever seen in it has a little mystery, a sparkle that attracts, a definite message, excellent composition, pertness that borders on the saucy, and it makes a fine cover picture since its subject matter is a quality result of a plating operation.

We got the picture from Platers Research Corporation to whom we are indebted for their courtesy. The nuts and bolts and springs and things in the picture are the product of barrel plating carried out (you guessed it) with a product of the corporation. It's nickel and it's brightly pretty.

This is fine industrial art.

Here's why this
PLATING ROOM FLOOR
will last for
FIFTY YEARS
or more!



. . . and will cost practically nothing for maintenance

1. It is built on a rigid, solid sub-base — 4" to 6" thick.
2. The sub-base is protected by a thick corrosion-resistant "Resilon" membrane.
3. Over the membrane, a course of dense, tough, spall-resistant "USSCO" acid brick.
4. Bonded by wafer-thin, non-porous joints with "Durisite" acid-and-alkali resistant cement.

Yes, here's a corrosion-resistant floor that will outlast the building itself. Expensive? Savings in maintenance, alone, will make it over the years the lowest cost floor you can install.

Write for this free booklet!

Detailed construction drawings showing approved methods of building floors, trenches, gutters, tank and motor supports, etc., with full technical data, photographs and case histories. Ask for Bulletin AB-17.

PROCESS EQUIPMENT DIVISION

U. S. STONEWARE

AKRON 9, OHIO

AB8 FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 448

Equipment & Supplies

E—432. Knitted Electrothermal Tape Finds Industrial Applications—In addition to its laboratory uses, electrothermal tape is finding many new industrial applications, such as on pipes, valves, gas cylinders, spray guns, and injection molding machines.

Knitted electrothermal heating tape doesn't buckle and can be stretched or squeezed to fit on the equipment being heated. It can frequently be repositioned without rewinding. Knitted electrothermal tape is the only type suitable for heating surfaces with a double curvature (as in photograph).

The current-carrying resistance bands are insulated on both sides by layers of knitted glass yarn. This construction makes it safe to wind electrothermal tape on metal. The insulation on both sides minimizes heat losses to atmosphere.

Heating with knitted electrothermal tape is efficient and economical; ½-, 1-, 2-, and 3½-inch widths are furnished in lengths of 2, 4, 6, and 8 feet.

E—433. A new low cost Dresser Cutter for sharpening abrasive discs has been announced by Besly-Welles Corporation, manufacturers of precision grinders, abrasives and high speed cutting tools. New design features are said to improve dressing performance and increase cutter life.

Important Notice to Members and Subscribers

If you are going to move, it is necessary that the proper notification be made, at the earliest possible moment, so that you may continue to receive your copies of PLATING without interruption.

Such notification should be made to headquarters by letter, post card, or post-office form No. 22S, giving the old address as well as the new, with postal-zone number if any. You should also notify your local post office on postal form No. 22 of your change of address. Both postal forms are obtainable at any post office.

As considerable time is required to process a change of address, you are urged to advise the PLATING Circulation Department as soon as you know your new address, preferably three weeks in advance of moving.

PLATING
Circulation Department
445 Broad Street
Newark 2, N. J.

For Your Plating File!

Why Big Savings Result When You Electro-tin Copper Wire with B&A Tin Fluoborate

The use of a Baker & Adamson Tin Fluoborate bath in electro-tinning copper wire results in a uniform, easily-controlled tin coating. Tin consumption is reduced more than two-thirds as compared with hot-dipped coatings.

Moreover, copper wire with a fluoborate-plated tin coating of 100 millionths of an inch may be readily drawn through dies for burnishing or for reduction in gage. For example, a plated No. 20 wire can be reduced to a No. 34 wire—a type of processing impractical with hot-dipped wire because of the structure of the coating and its non-uniformity.

The electroplated wire comes from the fluoborate bath with a fine grain coating that has a white matte color, excellent solderability, and good shelf life. The fluoborate bath has no fumes, requires no ventilation, and operation is fast and simple compared with alkaline baths. For full information, write for Baker & Adamson Technical Bulletin TC-43441, or call your nearest B&A office. *No royalties need be paid to use this process!*

BAKER & ADAMSON® *Fine Chemicals*

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

10 Basic Advantages of B&A Fluoborate Baths

1. **No mixing or dissolving needed—supplied in concentrated form**
2. **Easier bath preparation**
3. **Stability of bath composition**
4. **Ease of control**
5. **Practically 100% anode and cathode efficiencies**
6. **High conductivity**
7. **Good covering power**
8. **Fine-grained deposits of good color**
9. **Fast, high-speed operation**
10. **Readily adaptable for lead-tin alloy deposits**

As with Tin Fluoborate in the electro-tinning operation described, other B&A Metal Fluoborates offer additional special advantages in particular operations. Profit by using them!

BAKER & ADAMSON PRODUCTS
GENERAL CHEMICAL DIVISION
Allied Chemical & Dye Corporation
40 Rector Street, New York 6, N. Y.

Free! Data sheets giving full information on lead and tin fluoborates plus Bulletin TC-43441 on electro-tinning of copper wire. Write today!

Name_____

Company_____

Address_____

City_____ Zone____ State_____ PL-4

get to

Circle cut-out shows Cleveland Auditorium—arrow points to its relative location in downtown Cleveland looking east from Superior and Euclid Avenues. The Auditorium is one of the outstanding exhibit facilities in the nation, and is conveniently close to most hotels and main shopping areas—one more reason why this year's Finishing Exposition promises to be the best in AES history.

- ✓ EXHIBITIONS
- ✓ SOCIAL EVENTS
- ✓ TENTATIVE PAPERS
- ✓ COMMITTEE PLANS

ready get set to go — to CLEVELAND!

MORE than 12,000 production and engineering executives are expected to attend the 1955 Industrial Finishing Exposition and the 42nd Annual Convention of American Electroplaters' Society. Both exposition and convention will be held at Cleveland Public Auditorium in Cleveland, June 20, 21, 22 and 23.

This will be the fourth Industrial Finishing Exposition sponsored by AES. The show was last held in Chicago in 1952. Nearly 200 firms have reserved over 30,000 square feet of exhibit area to display equipment, services and supplies used in the industrial finishing industry.

The educational sessions are being integrated so those attending can take full advantage of both the exhibits and technical sessions. A unique feature will be the close proximity of the meeting rooms to the exhibit area. Both will be under the same roof in Cleveland's huge underground auditorium exhibit halls.

For the first time, the AES educational sessions will be open to everyone attending the 1955 exposition. Sessions are being divided into morning and afternoon programs that permit those attending to hear a representative group of discussions on subjects they choose among design, construction, engineering, maintenance and operation, and also view all of the exhibits. No sessions or other activities are scheduled for Wednesday afternoon, June 22. This full afternoon is left open for everyone to visit the exposition.

This type of scheduling affords firms within easy driving distance of Cleveland an opportunity to arrange to send to each specific session the individuals most vitally concerned with the subjects to be discussed, thereby obtaining maximum benefit from the program without interfering with plant operations. The AES educational sessions and the exposition are planned for men in the plant as well as top executives. The Industrial Finishing Exposition is often described as the only show specifically designed for all phases in industrial finishing.

Expedited registration cards are being distributed throughout the industry by inserts in industrial finishing publications, direct mail to key personnel and by exhibitors. These also can be obtained upon request from Mr. Harold E. Bartlett, exposition manager, 1955 Industrial Finishing Exposition, c/o American Decorating Company, 1849 West 24th Street, Cleveland 13, Ohio.

AES membership is not required for attendance at the meetings or the exposition. Charges will be made only for the various social functions to be held in several hotels. The complete package of tickets can be purchased at the Registration Desk for $17.50 per person during the convention.

Arrangements have been made with the hotels in Cleveland to set aside blocks of rooms for the use of those attending the convention and exposition. Make your hotel reservations as early as possible to Mrs. L. D. Perkins, Housing Bureau, Room 511, Terminal Tower, Cleveland, Ohio. The hotel in which you are placed will confirm your reservation directly to you. Be sure to state specifically the type of accommodations desired and time of arrival.

1955 INDUSTRIAL FINISHING EXPOSITION

Leon R. Westbrook, Chairman of the Industrial Finishing Exposition, announces that the following companies have reserved space in the 1955 exposition:

Acme Manufacturing Company
Allied Chemical & Dye Corporation, General Chemical Division
Allied Research Products Incorporated
Almco Division, Queen Stove Works Incorporated
American Brass Company
American Buff Company
American Platinum Works
American Smelting & Refining Company Federated Metals Division

Bacon Felt Company
Bart Messing Corporation
Battelle Development Corporation
Beacon Supply Company
Belke Manufacturing Company
Binks Manufacturing Company
G. S. Blakeslee & Company
Buckeye Products Company
Buckingham Products Company

Chandeysson Electric Company
Chemical Corporation
Circo Equipment Company
Cleveland Process Company
Commercial Filters Corporation
Consolidated Vacuum Corporation
Cowles Chemical Company
Cro-Plate Company Incorporated
Crown Rheostat & Supply Company
Curtis Machine Corporation

Dean Products Incorporated
Detrex Corporation
Diamond Alkali Company
Diversey Corporation
Dow Chemical Company
Du-Lite Chemical Corporation

E. I. duPont de Nemours & Company
Electric Products Company
Electro-Glo Company
Electronic Rectifiers Incorporated
Enthone Incorporated

Ferro Corporation
Finishing Publications Incorporated
Formax Manufacturing Corporation

G. S. Equipment Company
General Electric Company
General Ultrasonic Company
Globe Chemical Company Incorporated
Glo-Quartz Electric Heater Company Incorporated
Grav-I-Flo Corporation

Hammond Machinery Builders Incorporated
Hanson-Van Winkle-Munning Co.
Hardwood Line Manufacturing Co.
Harshaw Chemical Company
Haveg Corporation
Heatbath Corporation
Heil Process Equipment Corporation
R. O. Hull & Company Incorporated

Imperial Rack Company Incorporated
Industrial Electroplating Company Incorporated
Industrial Filter & Pump Manufacturing Co.
Industrial Finishing Magazine
International Nickel Company Incorporated
International Rustproof Corporation

Kocour Company
Kraft Chemical Co.

Lasalco Incorporatec
Lea Manufacturing Company
Lee-Ronal Incorporated

McAleer Manufacturing Corporation
McGean Chemical Company
Man-Gill Chemical Co.
Martindale Electric Company
Matchless Metal Polish Company
Metal & Thermit Corporation
Michigan Buff Company Incorporated
Michigan Chrome & Chemical Company
Mitchell-Bradford Chemical Company
Munning & Munning Incorporated

National Carbon Company
Nobles Engineering & Manufacturing Company

Oakite Products Incorporated

Patent Button Company
Pennsylvania Salt Manufacturing Co.
Platers Research Corporation
PLATING Magazine
Poor & Company, Promat Division
Production Machine Company
Products Finishing

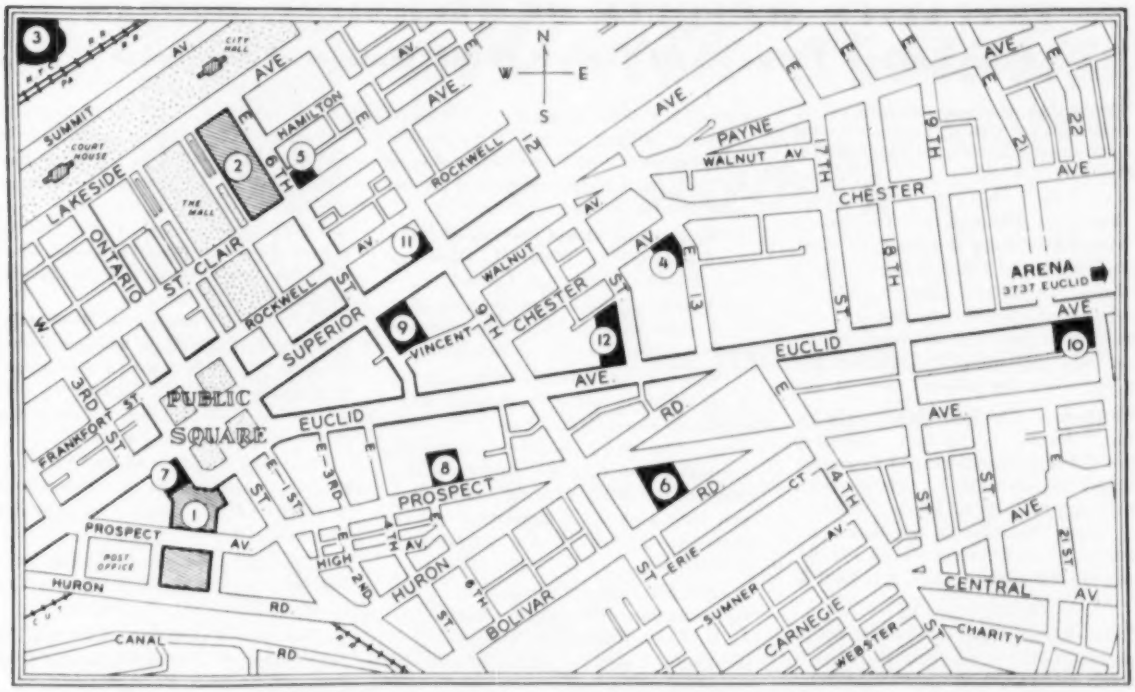
Ramco Equipment Corp.
Rampe Manufacturing Company
Rapid Electric Company
R. W. Renton & Company
Roto-Finish Company

Schaffner Buff Company
Schaffner Manufacturing Company
J. J. Siefen Company
Smoothex Incorporated
Solventol Chemical Products Incorporated
South Florida Test Service
Sparkler Manufacturing Company
Spee-Flo Manufacturing Corporation
Standard Electric Tool Company
Frederic B. Stevens Incorporated
F. J. Stokes Machine Company
Swift Industrial Chemical Company

Technic Incorporated
Ther Electric & Machine Works
H. O. Trerice Company
Tumbling Sales & Service Company

Udylite Corporation
Unit Process Assemblies Incorporated
United Chromium Incorporated
U. S. Stoneware Company
Univertical of Detroit

Wagner Brothers Incorporated
Wallace & Tiernan Incorporated
White-Roth Machine Corporation
Edwin L. Wiegand Company
Wyandotte Chemicals Corporation



MAP OF DOWNTOWN CLEVELAND

For your convenience, the hotels and Public Auditorium are shown on the above map of downtown Cleveland. Keyed numbers are: (1) Union Station—Terminal Tower; (2) Public Auditorium; (3) Stadium—Home of the "Indians" and the "Browns"; (4) Allerton Hotel; (5) Auditorium Hotel; (6) Carter Hotel; (7) Cleveland Hotel; (8) Colonial Hotel; (9) Hollenden Hotel; (10) New Amsterdam Hotel; (11) Olmsted Hotel; (12) Statler Hotel

SOCIAL CALENDAR

1955 AES Convention and Finishing Exposition

Arrangements have been made for golf for a limited number of guests at four private clubs on Sunday, June 19, and Monday, June 20. The clubs are Chagrin Valley Country Club, Lakewood Country Club, Manakiki Golf Club and Sleepy Hollow Golf Club.

Other social functions at the AES convention are as follows:

Sunday, June 19, 8:30 p.m. —AES Get-Together Party, Ballroom, Hotel Statler

Monday, June 20, 9:00 p.m. —Metal Finishing Suppliers' Association Open House, Rainbow Room, Hotel Carter

Tuesday, June 21, 9 a.m. —Metal Finishing Suppliers' Association Brunch, Ball Room, Hotel Carter

9:30 a.m. —East–West Ball Game

12:00 noon —Metal Finishing Suppliers' Association, Annual Golf Tournament, Sleepy Hollow Country Club

Thursday, June 23, 7:00 p.m. —Annual AES Banquet, Rainbow Room, Hotel Carter

A well rounded Ladies' Program has been arranged to supplement the social activities listed above. The following are definitely scheduled:

Monday, June 20, 12:00 noon —Luncheon and Entertainment, Alpine Village

Tuesday, June 21, 12:00 noon —Aunt Ella Luncheon with Style Show, Higbee's Department Store (Sponsored by Oakite Products, Inc. Host: Dave Clarin)

Wednesday, June 22, 8:00 p.m. —AES Floor Show and Dance, Ball Room, Hotel Statler

Wednesday, June 22, 9:00 a.m. —Shopping Tour through Westgate Shopping Center, Luncheon and Entertainment, Lake Shore Hotel (Buses leave from Hotel Cleveland at 9:00 a.m.)

Thursday, June 23, 10:00 a.m. —Plato Party, Hotel Cleveland

TENTATIVE SCHEDULE OF TECHNICAL PAPERS

Convention Talks Will Cover Wide Range of Subjects

"ACCORDING TO JOHN B. WINTERS, EXECUTIVE CHAIRMAN, THE FOLLOWING PAPERS ARE TENTATIVELY SCHEDULED FOR PRESENTATION."

"Practical Methods for Treatment of Metal Finishing Wastes," by J. C. Hesler, Industrial Filter & Pump Manufacturing Company, Chicago, Illinois. Treatment of cyanide, chromic acid and heavy metal wastes is discussed in this paper, with appropriate flow diagram and cost figures for the different systems.

"Filtering Chrome Plating Solutions," by R. F. Ledford, Industrial Filter & Pump Manufacturing Company, Chicago, Illinois, and L. Gilbert, Rock Island Arsenal, Rock Island, Illinois—This paper describes a production installation where filtration is used and discusses the methods in which it is used in chrome plating.

"Metal Cleaning Evaluations Using Tagged Soils." by J. Hensley, Wyandotte Chemicals Corporation, Wyandotte, Michigan — Electrocleaning test procedures employing various types of soils tagged with carbon-14 are described.

"Qualities, Processing and Future of Porcelain Enamel and Ceramic Coatings" (author to be announced later). Paper discusses improvement of processing methods that should greatly increase the use of porcelain enamel for industrial, construction and domestic applications.

"Methods of Conducting Classes for Electroplaters," by Ezra A. Blount, Editor, Products Finishing Magazine, Cincinnati, Ohio—This paper will report on electroplating classes currently conducted in private educational institutions and in public school systems. It compares specific courses of study, course outlines, methods and techniques of teaching, development of laboratory experiments, selection of textbooks and other details.

"Lead-Tin-Antimony Alloy Plating," by R. T. Putnam and E. J. Roser, Pratt & Whitney Aircraft, division of United Aircraft Corporation, East Hartford, Connecticut—The paper covers the development of lead-tin-antimony alloy plating as a production process. It describes the effect of variations in solution composition and processing conditions, such as current density, temperature and agitation.

"Diffused Nickel-Cadmium as a Corrosion-Preventive Plate for Jet Engine Parts," by R. W. Moeller and W. A. Snell, Pratt & Whitney Aircraft, division of United Aircraft Corporation, East Hartford, Connecticut—This paper describes the engineering application of 0.0003-inch nickel plate, plus 0.0001-inch cadmium diffused at 630° F to provide corrosion protection to intricately shaped low-alloy sheet parts operating in jet engines at temperatures up to 1000° F.

"Electroless Nickel Plating of Nonconductors," by Philip H. Eisenberg and Harold C. Schneider, Sylvania Electric Products Incorporated, Bayside, New York—The paper describes cleaning and etching cycles, as well as plating solutions.

"Recovery of Plating Wastes," by Louis Weisberg and E. J. Quinlan, Electroplating Consultants, New York, New York—This paper describes the layout, operations and costs of a plant for recovering wastes from cyanide zinc plating and from a chromate conversion coating operation. Chromic acid is recovered by ion exchange.

"Electrotinning Copper Wire from the Stannous Fluoborate Bath," by A. E. Carlson, General Chemical Division, Allied Chemical & Dye Corporation, Edgewater, New Jersey—Describes a continuous process for tin plating of copper wire, which comprises a number of tanks for cleaning and electroplating at high speeds.

"Plating Beryllium Copper," by S. J. Morana, Beryllium Corporation, Reading, Pennsylvania—The subject matter of the paper is broken down into three major categories: Silver plating finished products, cadmium plating mill products, and chromium plating plastic mold dies, etc.

"Some Aspects of Solution Level Control," by John W. Holland, Loren Stevens, and Nello Arterburn (a committee of the Indianapolis Branch, American Electroplaters' Society)—The object of this paper is to emphasize the many relations of solution level control and to review some of the methods employed to accomplish better control.

"Progress Report on Outdoor Exposure Tests," by W. H. Safranek and C. L. Faust, Battelle Memorial Institute, Columbus, Ohio—Results of outdoor corrosion tests continue to show that bronze alloy plate is better than nickel plate for protecting steel from corrosion in industrial and especially in a seashore atmosphere.

"The Anodic Etch in Preparation for Plating," by V. L. McEnally, Jr., and Fred G. Brune, Chrysler Jet Engine Plant, Detroit, Michigan—The use of a sulfuric acid–epsom salt anodic etch solution in preparing ferrous parts for plating is discussed.

"A Study of Hydrogen Embrittlement in Regard to Electroplating," by Carl Biser, Case Institute of Technology, Cleveland, Ohio—Part A: A sound and color movie on hydrogen and hydrogen embrittlement explaining hydrogen embrittlement in a graphic manner. Part B: A technical paper telling how penetration of hydrogen in steel is cathodically charged and a study of the depth of penetration of hydrogen in cathodically charged steel with varying critical factors.

"A National Survey of Production Costs in the Job Shop Plating Industry," by a representative of the National Association of Metal Finishers—A compilation of data obtained by a national survey of the job shop industry.

"Current Ripple and Its Effect on Plated Deposits," by a representative of R. O. Hull & Company Incorporated, Cleveland, Ohio.

"Tin and Tin Alloy Plating," by Robert T. Gore, Metal & Thermit Corporation, New York, New York.

"Vacuum Metalizing of Metal," by J. G. Seiter, F. J. Stokes Machine Company, Philadelphia, Pennsylvania.

"Outlook for the Distribution of Nonferrous Metals," by Simon Strauss, American Smelting & Refining Company, South Plainfield, New Jersey—A discussion of the available supplies and expansion for copper, zinc and cadmium.

"A Study of Copper Phosphorous Alloy Anode Corrosion," by Atillio Bission, Federated Metals Division, New York, New York.

"Copper Anode Corrosion in Cyanide and Acid Copper Plating Baths," by W. H. Safranek and C. L. Faust, Battelle Memorial Institute, Columbus, Ohio.

"Fatigue Limit in Chrome Plated Steel." by a representative of United Chromium Corporation, New York, New York—A continuation of past studies.

"Factors Affecting the Wear Life of Cloth Buffs," by Ellsworth Candee, Lea Manufacturing Company, Waterbury, Connecticut—Discussion of a long production test carried on by a large cloth buff manufacturer and a manufacturer of buffing compounds. Purpose of the test was to determine the important factors and their relative effect on the life of buffs.

"Abrasive Blasting as a Metal Finishing Tool." by C. Forestek, Forestek Plating Company, Cleveland, Ohio, and G. Haufman, Cleveland Cap Screw Company, Cleveland, Ohio—The paper discusses preparation of metal surfaces for plating, and increasing the effective life of dies and tools.

"The Theory and Practice of Airless Spray Painting," by a representative of Bede Products Division, U. S. Automatic Machine Company, Cleveland, Ohio.

Worth crowing about . . .

for ELECTROLYTIC CLEANING of STEEL and COPPER

New Improved AHCOLOID "200"

Non-dusting, low foaming, *improved* Ahcoloid 200 is safer and easier to use than conventional heavy duty cleaners. Special Ahcoloid agents control escape of gases generated during anodic or reverse current cleaning. There is never a spray or overflow of caustic solution.

New, improved Ahcoloid 200 is a free-flowing alkaline powder that quickly and thoroughly frees steel or copper surfaces from grease, oil, metal particles, carbon deposits, or residue from such operations as buffing, stamping, or grinding.

It will pay you to find out more about *new, improved* Ahcoloid 200, the heavy duty cleaner with extra penetrating, wetting, and emulsifying power.

For full details about *new, improved* Ahcoloid 200, write today to Apothecaries Hall Company, 22 Benedict Street, Waterbury, Connecticut.

Apothecaries Hall Co.

Patent Abstracts

DR. D. GARDNER FOULKE

Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,694,001—Polishing Stainless Steel—S. Hays and J. Lonkin, assignors to Armco Steel Corporation, Baltimore, Md., November 9, 1954.

An aqueous bath is described made up of 2–8 per cent nitric acid, 4–15 per cent hydrochloric acid, 2–15 per cent hydrofluoric acid and 3–18 per cent sulfuric acid containing a compound of the alkaloid class in the amount of 0.05–6 per cent by weight of the bath.

–AES–

No. 2,694,005—Separation of Nickel and Cobalt Metal from Acidic Solution—F. A. Schaufelberger, assignor to Chemical Construction Company, New York, November 9, 1954.

The solution is adjusted to a free acid content of about 5 per cent, heating to 250° F in the presence of a reducing gas and compatible electrolyte, the anion of which is capable of forming a gas-reducible anion complex with nickel (ammine), resulting in reduction of the nickel.

19 claims.

See also **No. 2,694,006,** a companion patent.

13 claims.

–AES–

No. 2,694,017—Process of Chemical Nickel Plating of Aluminum and Its Alloys and Baths Thereof—H. Reschan and A. Krieg, assignors to General American Transportation Corporation, Chicago, Ill., November 9, 1954.

A process for chemically plating aluminum with nickel is described which employs a nickel salt-hypophosphite bath containing a nitrate in the amount of 0.15–0.50 mol/l. Claim 3 claims the use of a fluoride in the amount of 0.01–0.04 mol/l along with the nitrate. The disclosure states the nitrate ions "inhibit" the catalytic surface of the aluminum and permit aluminum to be plated at a satisfactory rate. The plating rate of such a stabilized bath may be greatly increased by adding the fluoride ion.

10 claims.

–AES–

No. 2,694,019—Process of Chemical Nickel Plating and Baths Therefore—G. Gutzeit, assignor to General American Transportation Corp., Chicago, Ill. November 9, 1954.

A process is claimed for the electroless nickel plating of objects of copper, silver, gold, aluminum, iron, cobalt, palladium and platinum in an aqueous nickel salt-hypophosphite bath containing a simple short chain saturated aliphatic dicarboxylic acid and a fluoride in which the fluoride concentration is between 0.01–0.12 mol/l. The fluoride ion is described in the disclosure as an exaltant and as such increases the plating rate.

13 claims, 1 figure.

No. 2,694,040—Methods for Selectively Plating p-type Material of a Semiconductor Containing a p-n Junction—G. Davis and M. Waltz, assignors to Bell Telephone Laboratories, Inc., New York, November 9, 1954.

A method for defining the p-n junction in a semiconductive body by selectively plating metal on the p-type material by immersing the junction in the plating bath and connecting the negative current source to the p-section and the positive source to the n-section thereby passing the current around the junction for sufficient time to form a defining zone on the p-type material adjacent to the junction.

7 claims, 2 figures.

–AES–

No. 2,694,041—Electrodeposition of Nickel—Henry Brown, assignor to the Udylite Corporation, Detroit, Mich., November 9, 1954.

A bath for depositing lustrous nickel is claimed which consists of nickel sulfate and/or chloride containing 0.5–3.0 g/l of coumarin sulfonic acid. The use of about 0.5 g/l of benzene sulfonamides and sulfonimides therewith is also claimed.

–AES–

No. 2,699,382—Method of Etching Aluminum Foils—D. Altenpohl, assignor to Aluminum Walzwerke Singen, Singen, Germany, January 11, 1955.

A method for etching aluminum foil to increase its surface uniformly by successive etching in rapid and slow etching solutions. The disclosure reports more rapid and uniform etching of condenser plates and mentions 33° C warm 15 per cent HCl plus 50g $FeCl_3$ and 10g Al^{+++} per liter for first etch and 20° C warm 20 per cent HCl with 5g Al^{+++} per liter in the second stage.

2 claims, 3 figures.

–AES–

No. 2,694,647—Process for Applying Fused Metal Coating Onto a Metal Base—N. Cole, Detroit, Mich., November 16, 1954.

To fusion bond a coating onto a metal article by placing particles of metal, capable of fusing above 1500° F and having a substantial plastic range below the melting point of the article, on a liquid sodium silicate adhesive including a water soluble proportion of borax to temporarily retain such particles. Then heat to a temperature within the plastic range at which point said metal will displace the adhesive and bond to the metal article. The heating is accomplished by immersing in a fused bath of boric oxide.

26 claims.

–AES–

No. 2,694,657—Pickling Ferrous Metals—N. Brundin, assignor to Ekstrand & Tholand, Inc., New York, November 16, 1954.

The process describes the use of an aqueous ammonium bisulfate solution at pickling concentration and temperature.

–AES–

No. 2,694,658—Metal Stripping Process—W. Crepeau and V. Sullivan, assignors to the Stepan Chemical Co., Chicago, Ill., November 16, 1954.

The patent covers a method of stripping polyvinyl alkanol (formal, acetal, butyral) resins from metals by treating with dimethyl sulfoxide until the resin softens. The resin is then separated from the metal.

8 claims.

–AES–

No. 2,698,783—Method for Making Polishing Discs—P. Jones, assignor to General Motors Corp., Detroit, Mich., January 4, 1955.

A method is described for making polishing discs wherein all the compressing and compacting of the inner peripheral parts of the discs is done prior to mounting on the arbor, thereby eliminating the need for tightening the arbor nut from time to time.

4 claims, 7 figures.

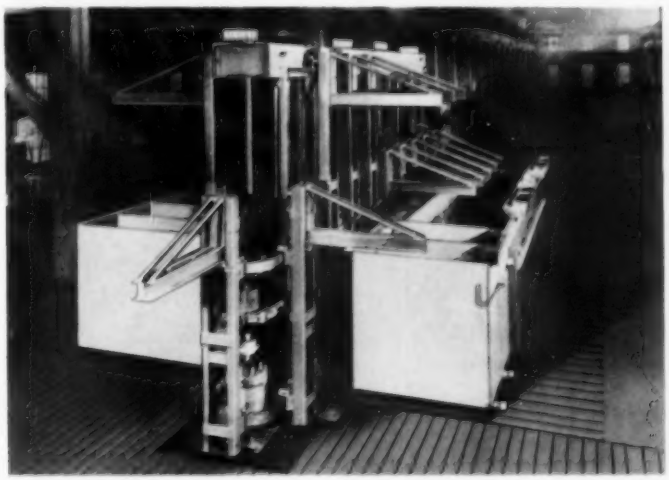
STEVENS *Slants* ON METAL FINISHING

"FROM THE CASTING OR STAMPING TO THE FINAL FINISH"

ANNOUNCING THE "STEVADOER"—A HEAVY-DUTY AUTOMATIC PLATING AND PROCESSING MACHINE

751st Machine by Stevens Designed for Single or Double Row and Automation

After three years of design, development and testing Frederic B. Stevens Inc. is proud to introduce to the metal finishing industry its new heavy-duty plating and processing machine—the "Stevadoer." This new machine has been built to complement the Stevens A and B Model Rack Type machines and the famous Stevens Model C and Super E Automatic Barrels. With the new "Stevadoer"—now more than ever, Frederic B. Stevens, Inc. lives up to its program of "Everything for Metal Finishing."



Load end view of the new Stevens "Stevadoer," automatic plating and processing machine.

When the "Stevadoer" first went to the drawing board the management directive called for unlimited lift, heavy load capacity, increased flexibility and versatile design to meet tomorrow's requirements of higher production—all of which have been incorporated in this outstanding new machine.

Take a look at the new Stevens "Stevadoer" and you will know that here is one of the most ruggedly built, compact metal finishing machines ever built. It will take almost unlimited rack sizes and will lift extreme weights. It has a high lift yet is designed to take up a minimum amount of height and floor space as compared to competitive machines of similar capacity.

As has always been true of all Stevens machines, the "Stevadoer" has great mechanical flexibility. The Stevens-pioneered delayed set-down mechanism which provides independent timing in one or more tanks is, of course, a part of the design. Then, there is a timer control which permits a carrier arm to skip any particular tank or operation if desired.

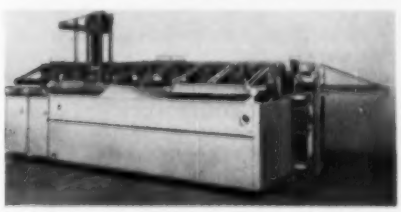
Smoothness of operation is another outstanding feature of the "Stevadoer." All lift and horizontal motion is accomplished by hydraulic power. Special controls permit independent adjustment of acceleration and transfer speeds to accommodate all extremes of weight and rack size.

The side arm design of the "Stevadoer" eliminates all moving mechanism over the solutions, and all internal mechanisms are installed below tank level. These features eliminate the possibility of contamination of processing solutions resulting from lubrication material, hydraulic oils and metallic wear. This design also reduces to a minimum the exposure of critical moving parts to the corrosive atmosphere of acid, alkalies and water vapor.

Safety requirements are built into the machine in that a 20-inch cat walk or wider can be easily provided between the processing tanks and the mechanism on two-row machines. This is, of course, extremely helpful in removal of anodes, inspection and maintenance without the hazard of working over hot processing tanks.

Access space for anode service and safety—a feature of the new Stevens "Stevadoer."

With the automatic loader and unloader the "Stevadoer" becomes the last word in automation. Racks are brought to the machine by overhead conveyor from polishing and buffing departments and automatically loaded without the use of manpower. After plating or other metal finishing processes have been completed the racks are automatically removed from the machine and rerouted to the proper department by the conveyor. Only one man is required to supervise the operation of the big capacity "Stevadoer."



Side view of the new Stevens "Stevadoer," plating and processing machine.

Frederic B. Stevens has more than 35 years experience in designing and building plating and processing equipment. If you are interested in high performance at low cost in metal finishing, check with Stevens, who can furnish you with the right machine for the job.

STEVENS *Slants* ON METAL FINISHING

MEET "LITTLE STEVE" AT A.E.S. SHOW

Plan to attend the American Electroplaters' Society Convention in Cleveland, June 20 to 23 and be sure to drop around to the Stevens exhibit and see "Little Steve"—another new Frederic B. Stevens, Inc. development.

Perhaps you have always wished for an automatic plating or processing machine for your job shop or plating department but didn't think you could afford one—well, look at "Little Steve."

"Little Steve" is a small automatic with a big capacity for its size. It will give you automatic production and automatic control—fewer rejects, dependability and lessens occupational disease hazards. With "Little Steve" you can eliminate a lot of the human element in your metal finishing operations and you can do it at a surprising low cost.

EX-CELL-O INSTALLS STILL TANK LINE

A still tank line for the plating of jet engine turbine discs was recently installed by Frederic B. Stevens, Inc. for the Ex-Cell-O Corporation at their Lima, Ohio plant. Stevens engineered the entire job and furnished rectifiers, Koroseal* lined and still tanks, horizontal barrels and a complete waste disposal system.

A view of the Stevens still tank line installed at the Ex-Cell-O Corporation, Lima, Ohio plant.

Since the turbine discs are spin-tested after plating in order to check the proper balance, the plating specifications must be rigidly adhered to, both for thickness of plate and spreading.

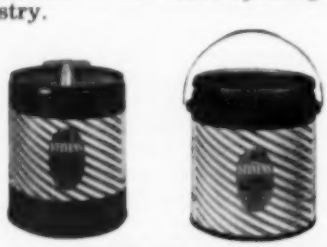
WASTE TREATMENT

For disposal of cyanide and chromium plating solutions a Stevens waste disposal system was engineered and installed. The treatment called for total destruction of the solutions and all conditions were met with the Stevens equipment. Approval was given by the Ohio River Valley Water Sanitation Commission. After going through the Stevens engineered waste system the treated waste is released into the regular sewers.

This waste disposal unit treats chromium and cyanide plating solutions.

NEW CADMIUM AND ZINC PROCESSES

Frederic B. Stevens, Inc. recently announced two fine new plating processes to the electroplating industry.



Stevco Bright Cadmium Process will furnish bright deposits to meet definite thickness of deposit and corrosion protection specifications. This process will impart a high lustre over a wide range of current densities. It is easy to control and offers increased operational economy resulting from complete solution integration.

Stevco Bright Zinc Process consists of water soluble Stevco Zinc Salts and economical Stevco Liquid Zinc Brightener. It produces a ductile bright zinc deposit of close grain structure, is easy to handle and also produces a bright plate. It has high conductivity which means fast plating and good distribution.

Finished work can be bright dipped or given a chromate treatment.

L.V.* REPORTS BIG AID TO FINISHERS

To assist in meeting industry problems in buffing and polishing, Frederic B. Stevens, Inc. maintains a laboratory which is always at your service. Send us a sample of your work and tell us the results you desire. We will recommend the materials, buffs and equipment in a complete formal *Laboratory Verified report.

*TRADE MARK B. F. GOODRICH

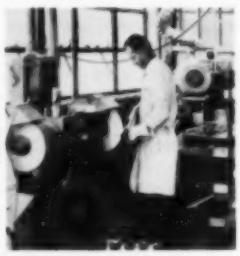
THE FINISHING TOUCH

VERSATILITY OF ALUMINUM FINISHES

by A. H. Kirkpatrick
Stevens Special Project Engineer

A look at the 1955 design engineer's drawing board leaves little doubt that aluminum is past adolescence.

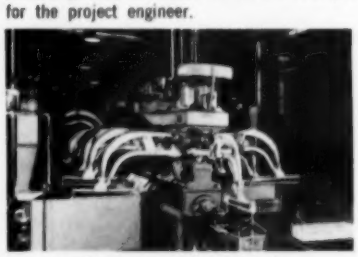
Aluminum responds to any number of finishing processes. Polishing and buffing will produce both satin and mirror bright finishes. Barrel Roto-Finishing will remove minor surface irregularities and improve the finish of small castings and forgings.



Stevens L. V. Experimental Aluminum Buffing Operations.

Many chemical and electro-chemical immersion finishing processes, including anodic etching, electroplating, anodizing, electropolishing and bright dipping add versatility to the finishing of aluminum. In anodizing, dyes can be added for brilliant colored finishes.

Aluminum's coming of age makes the task of producing these aluminum finishes a real job for the project engineer.



Stevens Automatic Equipment for bright dipping of aluminum.

Today, increased production, lowered costs and improved finishes, resulting from automatic, **job-qualified**, finishing installations are available to finishers of aluminum through Frederic B. Stevens, Inc. Stevens experience in the field of aluminum finishing ranges—

From the anodizing of refrigerator trays to the coloring of tumblers . . .

From the plating of automotive trim to the buffing of light reflectors . . .

From tumble finishing of aircraft assemblies to the alroking of rivets . . .

Stevens can engineer and build complete automatic or still tank installations for any chemical or electro-immersion aluminum finishing process—furnish the supplies and equip your company to do the best job at **lowest** cost. If it's made of aluminum we know how to finish it.

STEVENS *Slants* ON METAL FINISHING

ONLY STEVENS HAS FULLY AUTOMATIC BARREL—NO BARREL LIDS TO REMOVE FOR LOADING OR UNLOADING

Complete automation in small parts plating can be accomplished with a Stevens Automatic Barrel Plating Machine since the open end barrels permit mechanical loading and unloading of small parts without the need for manpower. In automatic barrel machines using horizontal cylinders it is necessary for workmen to remove the cylinder lids for loading and unloading. Stevens machines therefore, fit ideally into a fully automated factory production line.

The time tested Stevens Automatic Barrel Machines are noted for their economy, plating performance and simplicity. In fact, more Stevens Automatic Barrel Machines have been sold than all other makes combined. A few of the other many features are: Uniformity of plate, minimum of labor, less rejects, no mixing of parts and low maintenance costs.

Roller conveyors bring small parts to Stevens Automatic Barrel machine for processing. **Lower Left:** Open end of barrel cylinder permits automatic loading. **Upper Right:** Up position of barrel, cylinder unloads by gravity.

USERS ACCLAIM STEVENS AUTOMATIC BARREL MACHINE

Users everywhere praise the Stevens Automatic Barrel. For example—

The Maytag Company in Newton, Iowa, says—"*Quality improved 70%. Our Stevens Machines give a substantial savings in manpower and require little maintenance.*"

Daisy Manufacturing Company, Plymouth, Michigan—"*Bringing new profits and efficiency to our operation which requires a copper coating of shot pellets.*"

After copper coating at Daisy Mfg. Co. shot is dumped by the revolving barrel.

Thousands of small parts are zinc plated at the Unistrut Corporation plant at Wayne, Michigan. They report—"*Less handling, quicker shipments, smaller inventories plus a 50% plating cost reduction.*"

Homer A. Doerr & Son, St. Louis, Missouri, a thirty-year-old job plating firm, says—"*Gives us more uniform results, to closer tolerances, at higher production by far than with equipment formerly used.*"

A diversified group of parts is plated daily by this Stevens Automatic Barrel Machine.

The report of the Schlage Lock Company of San Francisco, California, is—"*We get a more durable finish . . . better results . . . with our Stevens Automatic Barrel plating installation.*" These are but a few comments from hundreds of satisfied users.

Stevens 750th automatic being readied for shipment to Spectronome Plating Co., Inc., New York City.

WRITE FOR FREE UTILITY FOLDERS

When you write for Stevens literature we mail the samples in a utility folder which can be used for three important purposes—a stock record to help you check your inventory—an emergency First Aid chart for plating room accidents—or a folder to file your Stevens literature. Write for your folders today.

Used for an inventory check. (top) a First-Aid chart. (middle) or a file folder for your Stevens literature.

MOVIE AVAILABLE FOR SHOWINGS

"Industrial Album," a twenty-six minute, 16-mm. sound film featuring the famed Stevens Automatic Barrel Machine is available for showings in your plant. Write us today and we will gladly arrange for a booking.

BRANCHES: BUFFALO • CLEVELAND • INDIANAPOLIS • NEW HAVEN

REPRESENTATIVES IN ALL PRINCIPAL CITIES

FOUNDRY FACINGS | GRINDING OPERATIONS | BLAST FINISHING | BARREL TUMBLING | METAL CLEANING | POLISHING & BUFFING | AUTOMATIC FINISHING | AUTOMATIC PLATING | METAL RECLAMATION

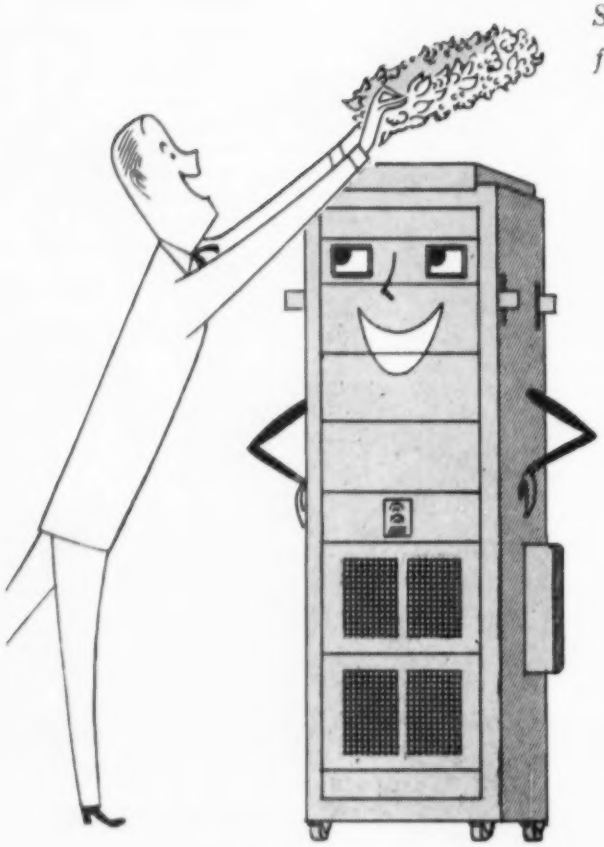
STEVENS

YOUR METAL FINISHING SUPERMARKET

Metal Finishing equipment and supplies from castings or stampings to finished product

DID YOU KNOW?

NEARLY EVERY FEATURE NOW AVAILABLE ON ELECTROPLATING RECTIFIERS WAS ORIGINATED BY GREEN ELECTRIC — AND MOST OF THESE OVER A DOZEN YEARS AGO



MUNNING-GREEN RECTIFIERS

. . . Best in the World!

Some of the standard and special features in Munning-Green Rectifiers:

- Skyscraper cabinets to save floor space
- Caster mounting to simplify installation
- Meters and lamps at eye level
- Controls and pushbuttons at hand level
- Twin pairs of output terminals
- Automatic current overload protection
- High temperature visual and audible warning signals
- High temperature automatic shutdown
- Anti-single-phase protection
- Downdraft cooling
- "L" circuit for low ripple and high efficiency
- Dual input
- Dual, triple and quadruple output
- Pushbutton remote control
- Automatic voltage stabilization
- Automatic current stabilization
- Automatic ampere-hour control
- Automatic time control
- Factory-tested at full load
- Detailed instruction book
- Unconditional two-year guarantee

EXCLUSIVE SOURCE:

MUNNING & MUNNING INC.

202-208 EMMET STREET, NEWARK, N. J.

(Sales offices and distributors in principal cities)

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 450A.

Analytical Determination of Trace Constituents in Metal Finishing Effluents

IX. THE DETERMINATION OF FREE CHLORINE IN EFFLUENTS

EARL J. SERFASS, RALPH F. MURACA AND D. G. GARDNER

THE FOLLOWING PAPER, THE NINTH OF A SERIES, IS A RESULT OF THE WORK SPONSORED AT LEHIGH UNIVERSITY BY THE AES AND THE OHIO RIVER VALLEY WATER SANITATION COMMISSION. WHILE THE ORIGINAL PROCEDURE WAS WORKED OUT UNDER AES SPONSORSHIP, THE MODIFICATION WAS DEVELOPED UNDER ORSANCO SPONSORSHIP, THE COMMISSION HAVING PLACED THE PROJECT AT LEHIGH SO AS TO BE ABLE TO UTILIZE THE BACKGROUND DEVELOPED BY AES PROJECT NO. 2. IT SHOULD BE NOTED THAT THE METHODS DESCRIBED IN THIS SERIES WERE TESTED, MODIFIED IF NECESSARY, AND RETESTED BY AT LEAST SIX AND SOMETIMES AS MANY AS TWELVE INDUSTRIAL LABORATORIES. AS A RESULT OF THIS, THE APPROVED FORM, AS PUBLISHED HERE, WAS DEVELOPED.

ABSTRACT

A colorimetric method is presented for the determination of 5 to 50 ppm of chlorine in effluents.

The method makes use of the standard APHA orthotolidine reagent to develop a coloration with free chlorine in a highly diluted sample of the effluent.

THE DETERMINATION OF FREE CHLORINE IN EFFLUENTS

The usual colorimetric procedure for determining chlorine in water, which involves the formation of a color with orthotolidine has not been thoroughly investigated with respect to cationic interferences. The presence of ferric and manganic compounds, oxidizing agents, and nitrites has been shown to effect the results obtained by this method. On the other hand, the extreme sensitivity of the test and the ease with which it can be carried out offer many advantages.

DESCRIPTION OF THE METHODS

A sample of effluent is diluted with chlorine free water, a suitable aliquot is treated with orthotolidine, and the intensity of the developed color is determined by comparison against permanent standards.

It was easily ascertained that the presence of many elements in concentration as high as 1 ppm each did not affect the formation of the orthotolidine color with chlorine. These elements are: zinc, arsenic, antimony, bismuth, nickel, copper, phosphorus as phosphate, cadmium, chromium (III) cobalt, lead, barium, silver, and mercury.

Certain elements can be tolerated in much higher concentrations (as much as 20 ppm of sodium, potassium, calcium, magnesium, aluminum, chloride, nitrate and sulfate), while certain elements must be essentially absent.

Since the concentration range of free chlorine is 5 to 50 ppm for this procedure, and the maximum amount of the usual elements will seldom exceed 50 ppm in a chlorinated effluent of the type that will originate from the waste disposal plant of a metal finishing industry, it was decided that by proper dilution, interferences from these elements could be minimized.

Color comparators are available which can be used conveniently for determining the free chlorine content of a water sample in the range of 0.1 to 1 ppm. A 50-fold dilution of the effluent will reduce the chlorine content from 5 ppm to 0.1 ppm which places it in the range of these instruments. By this dilution the concentration of many substances is reduced to the point where they do not interfere.

SENSITIVITY OF THE METHOD

The sensitivity of the method is defined as the number of micrograms of free chlorine which can be determined with a relative error of ± 50 percent. For the following procedure this corresponds to 5 ppm or 50 micrograms of chlorine in a 10 ml sample.

LIMIT OF DETECTION OF THE METHOD

The limit of detection of the method is defined as the number of micrograms of chlorine which must be present in the 10 ml sample in order that a difference of 0.05 ppm of chlorine can be detected in a clear sample in the comparator. This corresponds to 25 micrograms for the procedure described below.

RECOMMENDED PROCEDURE

This procedure is designed to analyze for free chlorine (HOCl, Cl_2, Chloramines, etc.) in the range of 5 to 50 ppm in the presence of a maximum of 1000 ppm each of sodium, potassium, calcium, aluminum, magnesium, sulfates, chlo-

rides, and nitrates: 50 ppm each of zinc, arsenic, antimony, bismuth, nickel, copper, phosphate, cadmium, chromium (III), cobalt, lead, barium, silver, and mercury, 10 ppm of ferric iron; 5 ppm of nitrites and 0.5 ppm of manganic manganese.

The procedure is essentially that presented in "Standard Methods for the Examination of Water and Sewage" 9th edition (1946).

REAGENTS REQUIRED

(1) *Orthotolidine:* Dissolve 1.35 g of orthotolidine dihydrochloride in 500 ml of distilled water. Add this solution, with constant stirring, to 500 ml of dilute HCl which has been made by mixing 350 ml of water with 150 ml of conc. HCl. Store this reagent in amber bottles in the dark; keep cool and away from rubber, and do not use after six months.

(2) *Test Water:* Add sufficient chlorine to ammonia-free distilled water to maintain about 1 ppm excess chlorine; allow to stand 30 minutes, then boil at least 30 minutes. Prepare and use this water within 96 hours.

SPECIAL EQUIPMENT

Hellige pocket-size water testing comparator or its equivalent. Permanent standards, 0.1–1.0 ppm chlorine.

PROCEDURE

(1) Pipette a 10 ml sample of the effluent into a 500 ml volumetric flask and dilute to the mark with test water. If a precipitate separates, centrifuge or allow to settle.

(2) Pipette 10 ml of the diluted effluent into the sample tube of the comparator and add 0.5 ml of the orthotolidine solution. Mix well. Preferably, keep the sample in a dark room or cabinet.

(3) Fill the other tube of the comparator with test water and add 0.5 ml of the orthotolidine solution. Mix well.

(4) Let both tubes stand for at least 10 minutes to obtain full color development.

(5) Match the intensity of the developed color with the permanent standards. Use the tube obtained in step (3) as a color compensator.

(6) Multiply the ppm of chlorine obtained in this way by 50 to obtain the actual chlorine content of the sample.

PROCEDURES FOR THE ANALYSIS OF 0.1 TO 5 PPM OF CHLORINE

The procedures indicated below are merely modifications of the recommended procedure. Only the sample sizes differ.

Range	PROCEDURE
0.1 to 1 ppm	Follow manufacturer's directions supplied with the color comparator, or, just omit step 1 of the recommended procedure and use a 10 ml sample of the effluent in step 2. Omit step 6.
1 ppm to 5 ppm	Dilute 10 ml of the effluent to 50 ml in step 1. Multiply by 5 in step 6.

Dr. Ralph F. Muraca has been a regular contributor to PLATING. He is an assistant professor in the department of chemistry at Lehigh University and was more recently associated with an AES committee which has contributed much to the improved style and format of PLATING. Dr. Muraca worked in cooperation with the ORSANCO committee on metal finishing wastes which recently published the book on "Procedures for Analyzing Metal-Finishing Wastes." This report incorporates results of AES project 2 at Lehigh University with which he was also associated.

Dr. Earl J. Serfass, a recognized authority in the fields of chemistry, electrochemistry and metallurgy, is serving his second consecutive term as chairman of the important AES Research Committee. He is presently compiling for the AES a "Process Control Handbook." Recently he

worked in cooperation with the Ohio River Valley Sanitation Commission which has just released a book on "Procedures for Analyzing Metal-Finishing Wastes," incorporating the results of AES project 2 at Lehigh University.

Donald G. Gardner was born in London, England in 1924. He received the degree of A.B. in chemistry from Princeton University in 1948. Before graduating he spent two and one half years in the Army with service in the Corps of Engineers in the ETO. He was employed at the Lederle Laboratories of the American Cyanamid Company as an analytical chemist before entering Lehigh University where he received the degree of M.S. in chemistry in 1952. At Lehigh he served as a research assistant on the Ohio River Valley Water Sanitation Commission project. He is currently employed at the General Laboratories of the United States Rubber Company in Passaic, N. J., as an analytical chemist.

Yellow Brass PLATING

By

E. J. Roehl* E. Michel* and L. R. Westbrook†

Yellow brass is probably the oldest commercially plated alloy, as published references extend back over one hundred years, and it is the subject of some of the earliest United States patents. The literature is voluminous and will not be reviewed here, since adequate discussions and references can be found in both editions of Modern Electroplating.

For convenience, this discussion will use the terms "brass" or "yellow brass" to cover the range 65–85 per cent copper, the balance zinc, in distinction from "white brass", a term which has been applied to a series of alloys of approximately the reverse composition.

Conventional brass plating is notoriously slow because of low cathode efficiencies, of the order of 75 per cent or usually much less, and low cathode current densities, of the order of 3–10 amp/sq ft. The present paper describes a new process by means of which high electrode efficiencies can be obtained at high current densities.

Numerous attempts have been made to improve the speed of brass plating baths through higher operating current densities and efficiencies, principally by increasing bath concentration, holding the "free" sodium cyanide concentration as low as possible and operating at high *p*H by maintaining a low and carefully controlled concentration of sodium hydroxide; all of these bath compositions had to be held within narrow limits in order to consistently produce satisfactory color and composition of deposit. None of these attempts has been commercially successful because, as cathode current efficiency improved, the limits within which the various factors of solution composition had to be controlled rapidly became narrower, particularly with regard to increase in cathode current density, so that a compromise had to be struck between a practical degree of control of bath composition and operating conditions, and bath efficiency.

Another difficulty in the operation of conventional brass plating baths has revolved around the tendency of brass anodes to polarize at relatively low current densities, usually above about five amp/sq ft, thus requiring higher generator voltages. When operated at anode current densities below that at which they polarize, brass anodes dissolve at around 100 per cent efficiency. Since the efficiency of deposition in commercial brass baths is usually much lower than 100 per cent, the result is a build-up of metal concentration in the bath, a depletion of free cyanide, and the formation of sodium hydroxide. The net result is that the solution is thrown out of balance and requires continuous addition of chemicals to maintain constant composition. One means of counteracting this effect is the partial use of inert anodes, but this is objectionable because inert anodes accelerate the rate of sodium cyanide consumption by oxidation, resulting in an undesirable increase in concentration of sodium carbonate, which must eventually be removed.

On the other hand, polarization of the anodes interferes with their dissolution and throws the bath off balance in the opposite direction, since if the anode metal efficiency is less than the cathode metal efficiency the metal content of the bath is depleted and excess sodium cyanide is formed if caustic is present; if it is not present, hydrogen cyanide is formed and oxygen is set free at the anode, some of which reacts to oxidize cyanide, with the resultant formation of undesirable carbonate.

Most brass plating is from dilute solutions and practically all brass plating solutions have one or more of the following relationships in common.

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(1) The copper-zinc concentration ratio is approximately the same in the bath as in the deposit, and usually within the limits 2:1 to 4:1.

(2) Sodium hydroxide is seldom present and, if it is, the concentration is very low, of the order of 7–8 g/l or less.

(3) The sodium cyanide concentration is in definite excess of that required to form the complexes $Na_3Cu(CN)_3$ and $Na_2Zn(CN)_4$, the excess being commonly referred to as "free cyanide". In some formulations the sodium cyanide concentration is equivalent to or in excess of the amount required to form the complexes $Na_3Cu(CN)_4$ and $Na_2Zn(CN)_4$. In fact, in conventional yellow brass formulations, the higher the concentration of free cyanide the easier it is to get good color in the brass deposits, but unfortunately the efficiency of metal deposition decreases rapidly with increase in free cyanide concentration, and this effect is magnified with increase in cathode current density.

EXPERIMENTAL

It was felt that a radically new approach to the problem would be necessary if a brass plating solution were to be developed from which deposits of constant composition and color could be obtained at relatively high anode and cathode current densities and efficiencies. Such an approach was found and a new bath composition developed which involved a high concentration of sodium and copper cyanides (essentially in proportion to form the complex $Na_3Cu(CN)_3$), sodium hydroxide in appreciable amounts to give high conductivity, and a very low concentration of zinc. Operating conditions are given in the accompanying table:

Solution Constituent	Operating Range g/l	Operating Range oz/gal
Sodium Cyanide (Total)	90–135	12–18
Copper Cyanide	75–105	10–14
Sodium Hydroxide	45– 75	6–10
Zinc Oxide	3– 9	0.4–1.2
Excess NaCN*	4– 19	0.5–2.5
Ratio of Cu:Zn in solution	10–20:1	
Temperature, ° F.	165–200	
Cathode current density, amp/sq ft	25–150	

*Excess over that required to form $Na_3Cu(CN)_3$.

It was found that the deposit composition and color remained relatively constant over the operating limits given in the table, varying over the range 75–83 per cent copper. Anodes of the same composition as the deposit are used, generally 75 per cent Cu, 25 per cent Zn. They should be of the highest purity obtainable.

Figure 1 gives the data obtained for the following solution composition: 110 g/l sodium cyanide, 90 g/l copper cyanide, 5.3 g/l zinc oxide, 60 g/l sodium hydroxide, and 4–9 g/l excess sodium cyanide. It shows the effect of cathode current density on cathodic efficiency at four temperature levels.

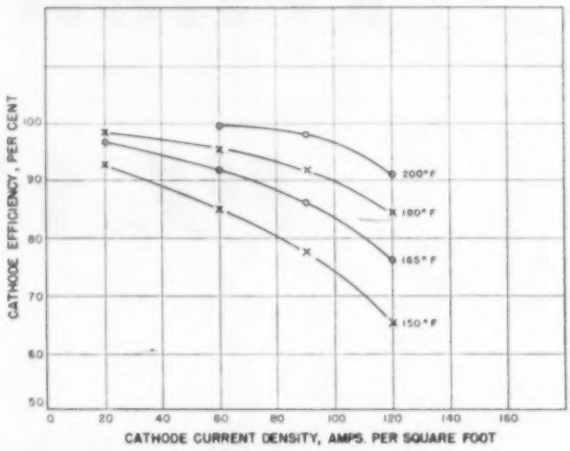

FIG. 1

Figure 2 shows the data obtained for the following solution composition: 90 g/l copper cyanide, 5.3 g/l zinc oxide, 60 g/l sodium hydroxide and variable sodium cyanide. It shows the relationship between excess sodium cyanide (over a 2:1 mol-ratio of NaCN/CuCN) and cathode efficiency for several current densities at 165° F.

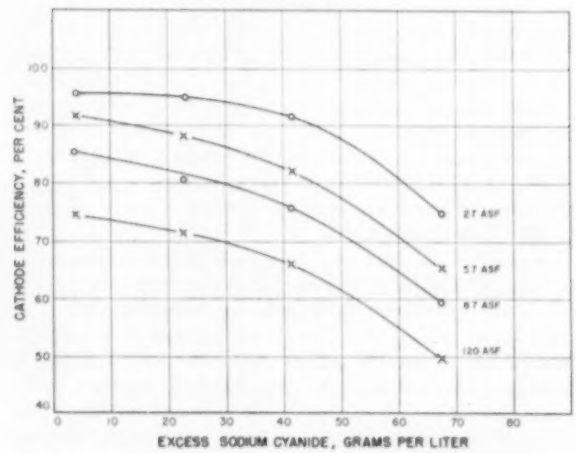

FIG. 2

The data of Fig. 3 were obtained by means of a probe, using the same solution composition as was used for the data of Fig. 1, and indicate the anode current density at which polarization occurs at each of four temperatures.

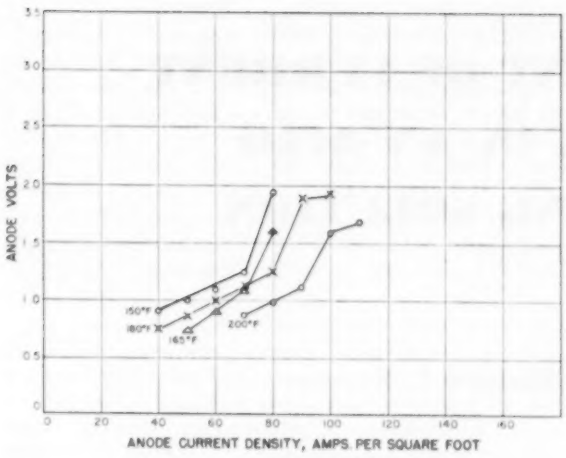

FIG. 3

DISCUSSION

The data of Figs. 1 and 2 indicate the unusually high cathode efficiencies which can be obtained with this bath, and at exceptionally high current densities. Most brass baths operate at about 75 per cent cathode efficiency, but to obtain this value a maximum current density of about 5 amp/sq ft is used. The present bath can be operated to give this 75 per cent efficiency at 150° F, but a current density of 100 amp/sq ft can be used so that the plating rate is several times that of a conventional bath. With higher temperatures, higher efficiencies can be obtained.

The data of Fig. 3 indicate the anode current density at which anode polarization occurs at each of four bath temperatures; 70 to 90 amp/sq ft between 150 and 200° F, values which can be compared to 5 amp/sq ft for conventional baths. Solution agitation of course will raise the upper limit of current density before polarization occurs, and values of 130 amp/sq ft have been obtained in practice at moderate temperatures.

The following points concerning the brass plating solution under discussion are of interest.

(1) The mol-ratio of NaCN to CuCN is essentially 2:1, no NaCN being required for the zinc content, which is added in the form of sodium zincate. Because of the low ratio, cyanide losses due to hydrolysis and oxidation are greatly diminished, and advantage can be taken of the desirable high temperature operating characteristics of the bath without suffering undue cyanide losses. A corollary is, of course, the corresponding relatively low rate of formation of carbonate.

(2) The sodium hydroxide concentration is relatively very high, which is desirable from the standpoint of providing high bath conductivity and high electrode efficiencies.

(3) The ratio of copper to zinc in solution is exceptionally high, of the order of 15:1, as compared to about 3:1 in the conventional baths.

(4) Because the anode and cathode efficiencies are essentially equal under normal operating conditions, the bath composition remains relatively constant. The color and composition of the deposit are controlled principally by holding the zinc concentration within relatively wide limits, rather than by carefully controlling free cyanide, *p*H or caustic concentration.

This bath has been operated for several years for the brass plating of continuous steel strip, and, as indicated above, the principal control is the zinc concentration of the bath, which requires only infrequent adjustment.

The subject matter of this paper is covered by U. S. Patent No. 2,684,937 assigned to the Pittsburgh Steel Co.

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THE MEASUREMENT OF CURRENT DISTRIBUTION IN AN ACID COPPER PLATING SOLUTION

By

Dr. E. J. Wilhelm* and Richard F. Kayser†

ABSTRACT

This paper deals with the development of a method of measuring the current distribution on the cathode with the aid of a small probe electrode placed against the face of the cathode. A simplified circuit was devised whereby the current flowing to the probe was measured with a milliammeter. The actual current density was obtained by referring the meter reading to a calibration curve. A copper probe was used to measure the current distribution on the cathode in a conventional, acid-copper plating bath. Some of the problems involved in making current measurements with a small probe electrode are discussed and a case in which the area of the cathode was varied in relation to the anode was investigated. Since the cathode polarization in this solution varies only slightly with current density, this system may be used to study primary current distribution.

INTRODUCTION

In recent years considerable attention has been directed to the study of current and metal distribution. This attention is the result of variation in the distribution of the thickness most plated coatings and its important bearing upon their protective value. To insure adequate protection many specifications require a minimum thickness of coating on significant surfaces.

Fundamentally the problem of metal distribution is complex, because it is the resultant of many individual factors, which are difficult to separate and investigate independently. Schaefer and Pochapsky[1] have collected and discussed, in a practical way, the effects of many of these factors, i.e., the throwing power of the bath, current density, tank and electrode geometry and addition agents, etc.

Actually the most important factor controlling metal distribution is the primary current distribution on the article being plated. Fundamentally metal distribution may be regarded as a function of (a) secondary current distribution resulting from the influence of polarization upon the primary current distribution, and (b) the respective cathode efficiencies at the prevailing current densities on the cathode. All of the other factors affecting metal distribution exert their influence by altering the secondary current distribution or cathode efficiencies. In other words the secondary or actual current distribution is the resultant of the primary current distribution and cathode polarization. The primary current distribution is a function only of the shape and dimensions of the plating system and the spacing of the electrodes. It is independent of the resistivity of the plating solution.

Kasper[2] was one of the first workers to emphasize that the primary current distribution has a much greater effect upon the secondary current distribution and resultant metal distribution than can be brought about by ordinary changes in cathode efficiencies and polarization. Recently Kronsbein[3] has presented an excellent treatment of current and metal distribution in electrodeposition which includes a critical review of the literature, theoretical considerations and some experimental determinations of metal distribution.

More recently Kinney and Festa[4] have published a new method for determining the primary current distribution in electroplating by the use of models. They determined the equipotential lines on a model of an actual cell in which conducting paper was used to simulate the plating solution. Low-resistance strips of silver paint were applied to the paper to serve as electrodes. The current flow lines were drawn in after the equipotential lines were plotted. An alternate method of locating the network of current-flow lines on an inverted model in which the conducting electrodes of the original model were replaced by nonconducting areas and the nonconducting areas were replaced by conducting areas.

Since primary current distribution is one of the most important factors in controlling metal distribution, the present investigation was directed to develop a simple method of measuring the current distribution by means of a probe electrode placed against the face of the cathode. In the past, current and metal distribution has been evaluated by measuring the weight or thickness of the deposit at different points on the surface of the cathode. Such measurements do not correctly determine the secondary current distribution in cases where the cathode efficiency varies with current density.

A small probe electrode was considered as a desirable method of approach, because it offered a simple and direct method for studying the effect of electrode shape, dimensions and spacing upon current distribution. In addition, for large cathodes with complex shapes, the probe could be

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placed in the most highly recessed area so that the resultant current density for a given current could be measured. The plating time to produce the minimum required thickness could be calculated from one current density measurement. It was hoped that such a probe electrode might be used as basis for adjusting the total current in the plating tank to obtain the desired local current density on shielded or exposed parts.

In 1939 Hull[5] described a strip electrode ($\frac{1}{2}$ inch wide by $2\frac{1}{2}$ inches long) and circuit which he used in determining the current densities across the inclined cathode in the Hull cell.

The experimental work of the present investigation was divided into three main groups: (1) study of the behaviour of a small probe electrode when used with the Hull circuit, (2) study of a simplified probe-circuit developed by the writers, (3) probe measurements of cathode-current distribution in a case where the electrode arrangement and size was varied.

DESCRIPTION OF PROBE ELECTRODE AND ITS OPERATION WITH THE HULL CIRCUIT

The cell and small probe electrode which were first investigated using the Hull circuit are shown in Fig. 1. The

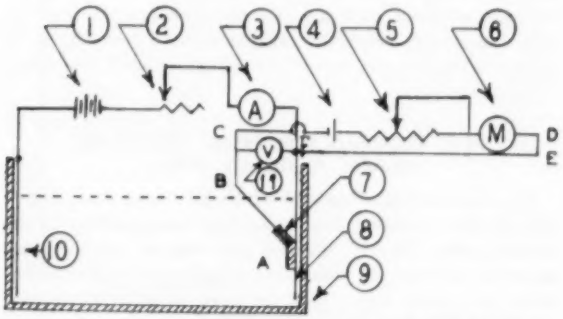


Fig. 1. Diagram of current density meter, showing electrical circuit and location of electrodes

Legend:

(1) 12-volt battery
(2) 18-ohm, 6-amp rheostat
(3) 0 to 5-amp Weston ammeter
(4) 1½-volt dry cell
(5) 1800-ohm, 0.5-amp rheostat
(6) 0 to 125 ma Weston milliammeter
(7) Insulated 18-gauge copper probe
(8) 2 in x $2\frac{13}{16}$ in 18-gauge copper cathode
(9) 3 in x $3\frac{1}{16}$ in x $7\frac{5}{8}$ in insulated rectangular cell
(10) 2 in x $2\frac{13}{16}$ 18-gauge copper anode
(11) Weston voltmeter, 20,000-ohm resistance on the 0 to 0.1-volt range

probe electrode was made of 18-gauge rolled copper and had an exposed area on one side of 0.001 sq ft. If this area was doubled or tripled, the current drawn by the probe was doubled or tripled. The back and edges of the probe were insulated from the solution. In attempting to insulate the probe, several stop-off compounds were tried. "Unichrome X" was found to be satisfactory. It was melted and applied to the probe and the excess trimmed with a razor blade. The detail of a probe electrode (0.38 inch x 0.38 inch) having a surface area of 0.001 sq ft is shown in Fig. 2. An acid copper sulfate plating solution was used as an electrolyte because its cathode polarization and efficiency did not

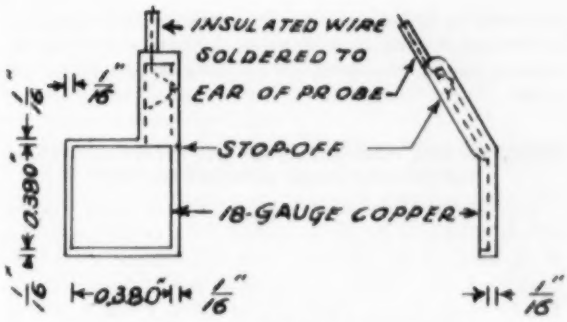


Fig. 2. Detail of probe electrode

vary appreciably in the range of current densities used. It had the following composition:

Constituent	Gms/Liter (H_2O)	Oz/Gal (H_2O)
$CuSO_4.5H_2O$	202.5	27.0
H_2SO_4 (sp. gr. = 1.84)	48.75	6.5

The current distribution was uniform in the cell of Fig. 1, because it had a uniform rectangular cross section and the electrodes were paralled and covered the narrow ends of the tank.

HULL'S CIRCUIT

At this point it is well to explain the basic principles of Hull's circuit for measuring current density. When a probe electrode of known area was placed against the cathode and was at the same potential as the cathode, the current striking this probe divided by the area of the probe would measure the current density in this region of the cathode. The probe electrode was maintained at the potential of the cathode by means of the probe circuit. The probe circuit, besides the milliammeter used to measure probe current, contained a rheostat and a No. 6 dry cell. The current which came to the probe generated a voltage drop in the milliammeter and rheostat. The resistance of the rheostat could be varied until the potential drop across it plus the drop across the milliammeter was exactly equal and opposite to the voltage of the dry cell. This then placed the probe electrode at the same potential as the cathode and it attracted the same current as the same area of the cathode would have, had the probe not been there. The flow of current in the probe circuit is more complex than indicated, and will be explained later.

The current flowing to the cathode was adjusted to any desired value by means of rheostat 2. The probe electrode was held against the cathode by a rubber band, with the insulated back of the probe pressed against the face of the cathode. A Weston voltmeter with a high internal resistance (20,000 ohms on the 0.1 volt scale) was used as a potentiometer to indicate when the probe electrode was at the same potential as the cathode. When the probe was placed against the cathode, this voltmeter, 11 in Fig. 1, immediately deflected and rheostat 5 was adjusted until the voltmeter read zero, when the probe was at the same potential as the cathode. The voltmeter was kept at zero by continually adjusting rheostat 5 in the probe circuit. It was assumed that an equilibrium condition was reached, when the voltmeter reading no longer drifted from zero. Since the area of the probe

was 0.001 sq ft and meter 6 in Fig. 1 indicated milliamperes (0.001 amp ÷ 0.001 sq ft = 1 asf), milliammeter 6 read the current density directly in asf on the area covered by the probe.

EFFECT OF SIZE AND SHAPE OF THE PROBE ELECTRODE UPON MEASURED CURRENT DENSITY

Since the current density measured by the meter was the current flowing to the probe divided by the area of the probe, it was believed that, beyond a certain minimum, the dimensions were not critical. Experimental results supported this belief. Probes having dimensions of 0.38 in x 0.38 in, 0.76 in x 0.76 in, 0.38 in x 0.76 in, and 0.38 in x 1.52 in were investigated. The current density readings obtained with these probes are listed in Table I. Each reading was taken after a steady state was reached.

EFFECT OF SURFACE CONDITION OF THE PROBE

Early in this investigation it was found that the surface condition of the probe and the time required to reach a steady state were additional factors affecting the current drawn by the probe. In order to more clearly show how these two factors are related, the effect of surface area will be considered first. There was tendency for nodules to form at the insulated edges of the probe when it was used for too long a period of time, especially at high current densities (20 asf and higher). These nodules increased the surface area and thereby increased the current density indicated by the meter. Table II summarizes the effect of probe surface on current density measurement.

In order to demonstrate quantitatively the effect of increased surface area, a corrugated probe was made. In the plane form, it had dimensions 0.76 in x 0.76 in, corresponding to an area of 0.004 sq ft. It was then corrugated as shown in Fig. 3, so that its overall final dimensions were 0.38 in x 0.76 in. While it had a surface area of 0.004 sq ft, it covered only 0.002 sq ft of the cathode surface. In other words, the corrugated probe had exactly twice the surface area of a plane probe with the same rectangular dimensions and would be expected to draw more current when maintained at the same potential as the cathode. The current density in the cell was adjusted to 4 asf and the corrugated probe was placed against the cathode. Milliammeter 6 (see Fig. 1) indicated a current density of 7.25 asf, about twice the actual current density.

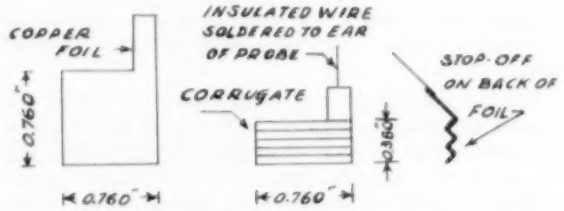


Fig. 3. Procedure in construction of corrugated probe

TIME REQUIRED FOR PROBE CIRCUIT TO REACH A STEADY STATE

The principal disadvantage of Hull's circuit was that it did not give a current density reading corresponding to the actual current density, until it had been in operation for about 45 minutes. In every case regardless of probe dimensions, the initial meter readings were 50 to 100 per cent higher than the actual current density in the cell. This high reading would fall off, rapidly at first and more slowly toward the end, until after about 45 minutes the needle of the voltmeter would cease to drift from zero, indicating that equilibrium had been reached. Figs. 4, 5 and 6 show how the current density measured by the probe electrode de-

TABLE I. CURRENT DENSITY READINGS GIVEN BY PROBES OF VARIOUS DIMENSIONS

	Measured Current Density (asf) for Probe Sizes Indicated			
Actual cd (asf)	0.38 in x 0.38 in	0.76 in x 0.76 in	0.38 in x 0.76 in	0.38 in x 1.52 in
2.0	1.8	1.9	1.9	2.0
3.0	2.9	2.9	2.8	3.0
4.0	3.9	3.9	3.6	4.0
5.0	4.8	4.9	4.5	5.0
6.0	5.7	5.8	5.4	6.0
7.0	6.8	6.8	6.2	6.9
8.0	7.7	7.9	7.2	8.0
9.0	8.7	8.8	8.2	9.0
10.0	9.9	9.6	9.5	10.0
12.0	12.1	12.0	—	12.0
15.0	15.5	15.2	14.0	15.0
17.0	17.6	17.1	16.0	17.5
20.0	21.4	20.3	19.3	20.5
40.0	42	—	—	—

TABLE II. EFFECT OF PROBE SURFACE ON CURRENT DENSITY MEASUREMENT

Condition of Copper Deposit on Probe	Actual cd (asf)	Measured cd (asf)
Thin smooth	5.0	4.6
Thick rough	5.0	9.3

Fig. 4. Effect of time on the current density recorded by a probe electrode in Hull's circuit where the true current density was 5 asf

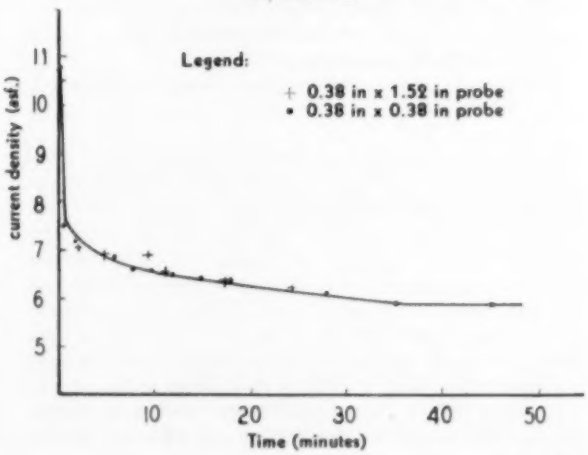


Fig. 5. Effect of time on the current density recorded by a probe electrode in Hull's circuit where the true current density was 10 asf

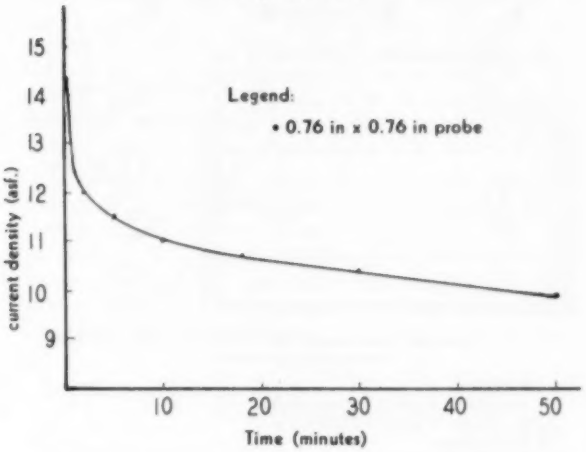
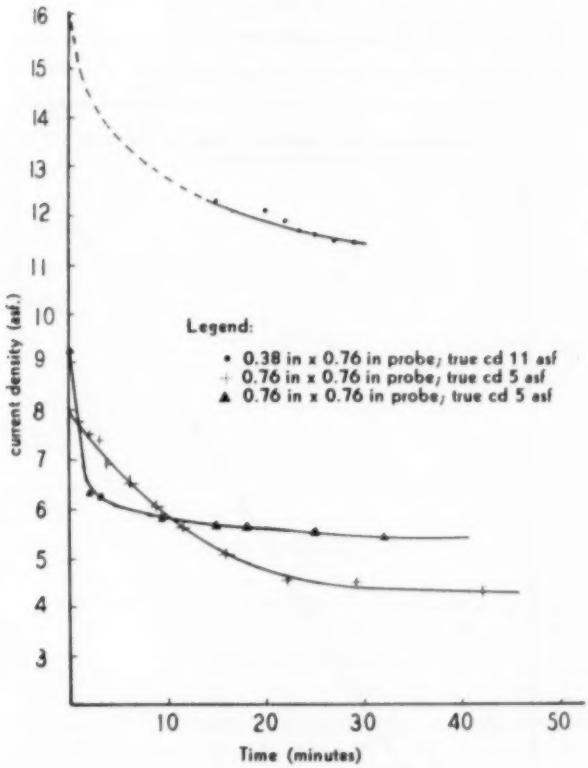


Fig. 6. Effect of time on the current density recorded by a probe electrode in Hull's circuit


Legend:
• 0.38 in x 0.76 in probe; true cd 11 asf
+ 0.76 in x 0.76 in probe; true cd 5 asf
▲ 0.76 in x 0.76 in probe; true cd 5 asf
current density (asf.)
Time (minutes)

creased with time and finally reached the true existing current density.

At this point attention should be called to the fact that Hull[8] did not rely on his metering circuit alone to determine the current distribution in the Hull cell. After commenting that the meter readings were high, he corrected them by adjusting the meter readings with current densities determined from the weights of copper deposited on the area involved.

In the following paragraphs an explanation of this phenomena is suggested. It is involved and can be omitted by any reader not interested in this aspect. It is based upon the instantaneous initial conditions existing before the probe circuit comes to a steady state.

The path A B C D E F in Fig. 1 indicates the probe circuit which consisted of the probe, dry cell, rheostat and milliammeter. This probe circuit can be considered as an additional plating circuit, since the negative pole of the dry cell was connected to the probe and the positive pole to the large cathode. With no plating current flowing in the cell the current from the dry cell in the probe circuit was small. At the instant current was passed through the cell, copper began to deposit on the probe at a higher rate than the cathode, since the probe was rendered more negative instantaneously by the dry cell in the probe circuit. It is believed that this additional negative potential attracted more copper ions to the probe, thereby causing the high initial current density on the probe electrode. Since metal deposited at a higher current density exerts a higher electrode potential than metal plated at a low current density, it was believed that the copper deposited at the higher current density on the probe set up a potential difference between the probe and large cathode. The initial potential of the probe was measured and, on the average, was found to be 0.002 volts greater than that of the cathode.

After the first instant of current flow in the main circuit, the probe circuit could be adjusted to make the potential of the probe the same as that of the cathode. The rapid attainment of a steady state was prevented by the fact that the copper, plated on the probe at the higher current density, was at a higher potential than that on the cathode, hence a larger current was required in the probe circuit to keep the probe at the same potential as the cathode. After the probe circuit was balanced several times and as copper continued to cover the original higher-current-density copper, the effect was to reduce the potential of the copper plated on the probe and to lower the current required in the probe circuit to maintain the probe and cathode at the same potential, thus accounting for the decrease in the milliammeter reading with elapsed time.

As previously pointed out, the current required in the probe circuit decreased at a decreasing rate, until at the end of about 45 minutes no further adjustment of the rheostat was required to keep the probe and the cathode at the same potential. At this time, the milliammeter reading corresponded to the actual current density on the cathode. The long time required to obtain a reading seriously limited the utility of the probe, especially at high current densities because the more rapid development of rough deposits which increased the effective surface of the probe and the current drawn by it.

The long time required to reach equilibrium could not be avoided with this circuit, even after the probe had come to a steady state at one current density. When the current density was changed to a new value, the probe required about 45 minutes before it reached equilibrium.

Several tests were conducted to reduce the time required to reach the steady state. Among them were a probe treating schedule, application of a low current density for known periods of time, agitation of the solution, etc. None of these methods were effective.

It was concluded that the probe circuit itself was theoretically at fault. The probe-circuit dry cell and rheostat which were used to cancel out the voltage drop across the

milliammeter, actually introduced an undesirable effect. It appeared that the dry cell caused the initially high current density and potential on the probe and should be eliminated. Without the dry cell and the rheostat, the probe and cathode if directly connected would be at the same initial potential and no time lag should occur due to electrochemical effects.

A SIMPLIFIED PROBE CIRCUIT

In order to evaluate the above possibilities a new circuit shown in Fig. 8 was devised. In the new circuit, no initial surge of current in the probe circuit occurred and the potential of the probe differed from the cathode only by the small voltage drop across the milliammeter with current flowing in the probe circuit. It was anticipated the low internal resistance of the milliammeter would decrease the current flowing in the probe circuit slightly and thereby give a slightly lower current density reading. However, this could be corrected by a calibration curve where the milliammeter reading was plotted versus the true current density maintained on the large cathode.

In order to keep the probe surface reproducible and to remove the copper deposited on it, the following procedure was used. The probe was cathodically cleaned in a hot, trisodium phosphate solution containing 45 gm/l of trisodium phosphate. It was then rinsed in distilled water and immersed in a bright-dip solution of the composition shown in Table III, until it was ready for use. At that time it was rinsed in distilled water and placed against the cathode of the cell.

TABLE III. COMPOSITION OF BRIGHT-DIP SOLUTION USED WITH SIMPLIFIED METER

Component	Specific Gravity	Grams/Liter
H_2SO_4	1.84	800
HNO_3	1.38	100
HCl	1.17	25
H_2O	—	491

During immersion, the probe was moved very rapidly from side to side in order to produce as smooth a surface as possible. It was kept in the bright-dip until most of the copper deposited during the previous measurement was removed and a smooth, shiny copper surface was produced. It was then rinsed in distilled water and placed against the cathode of the cell. The cathodic cleaning was needed only when the probe had been idle for some time, and not prior to every bright-dip operation. The bright dip was used only before the first of a series of measurements. Switch (3) of Fig. 7 was kept closed during the insertion of the probe. As soon as the probe was placed against the cathode, a stopwatch was started and after three minutes, switch (3) was opened and the reading of milliammeter (2) in Fig. 7 was recorded. This reading was then referred to the experimentally determined calibration curve and the true current density read from the curve. The calibration curve for each of the two scales on the Weston milliammeter is given in Figs. 8 and 9. With this circuit, a current density measurement was obtained in about four minutes. The calibration curves were obtained by plotting meter reading versus the true current density on the cathode in the rectangular cell.

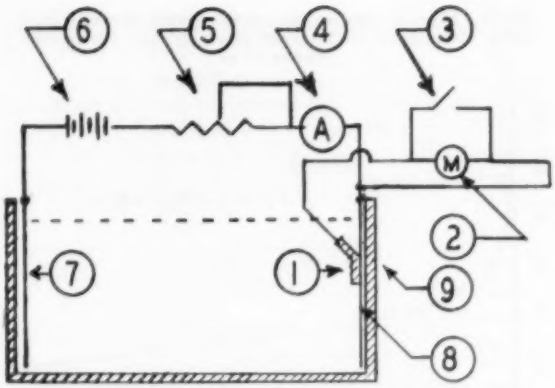
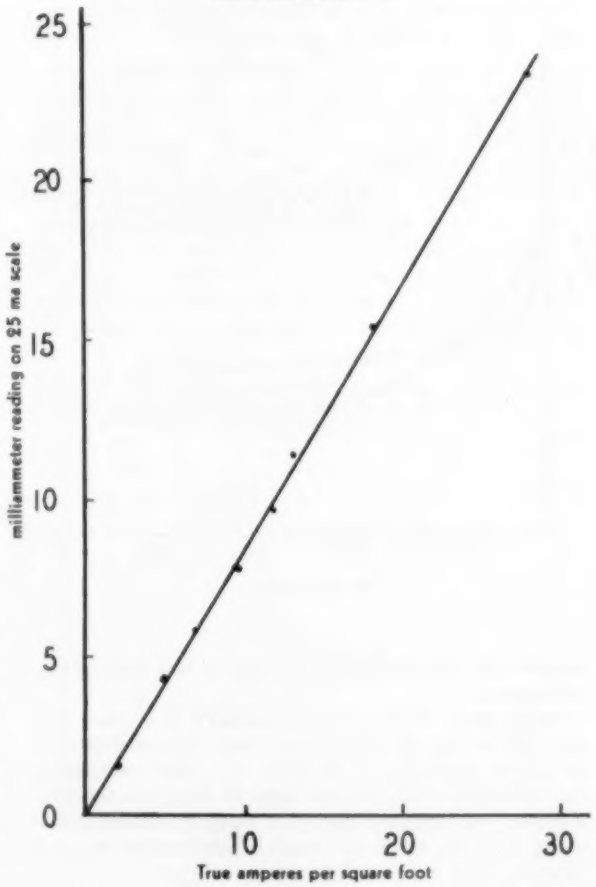


Fig. 7. Electrical equipment and wiring of the simplified current density meter

Legend:
(1) Insulated 18-guage copper probe
(2) 0-125 ma Weston milliammeter
(3) SPST switch
(4) 0-5 amp Weston ammeter
(5) 18-ohm, 6-amp rheostat
(6) 12-volt battery
(7) 2 in x 2$\frac{13}{16}$ in 18-guage copper anode
(8) 2 in x 2$\frac{13}{16}$ in 18-guage copper cathode
(9) 3 in x 3$\frac{1}{8}$ in x 7$\frac{5}{8}$ in insulated rectangular cell

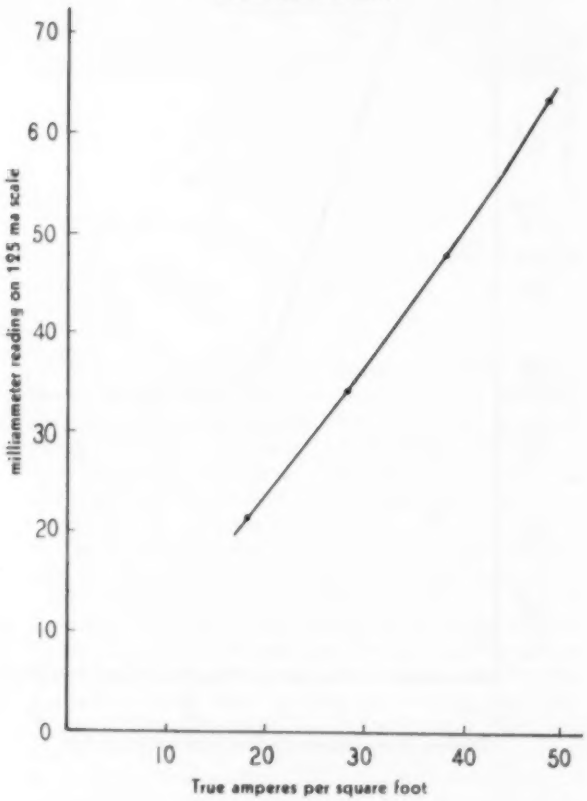
Fig. 8. Calibration of the simplified meter on the 0 to 25 ma milliammeter scale



For current densities under 20 asf, the calibration curve in Fig. 8 indicated that the internal resistance of the milliammeter decreased the current flowing in the probe circuit slightly and therefore gave readings slightly lower than the actual current density. However, by virtue of its thickness, the probe was slightly closer to the anode than the large cathode, hence the lower resistance of the shorter path between the anode and the probe partly compensated for the internal resistance of the milliammeter.

At current densities above 20 asf, where the high-range scale of the milliammeter was used, the low resistance of the shorter path between the anode and probe more than compensated for the internal resistance of the milliammeter and resulted in meter readings higher than the true values, as shown in Fig. 9. In each case the calibration curve compensated for both of these factors.

Fig. 9. Calibration of the simplified meter on the 0 to 125 ma milliammeter scale



The effect of increased surface area due to the roughness of thick deposits was eliminated by using the bright dip which produced a reproducible probe surface.

Since this circuit eliminated the dry cell which caused the initial surge of current in the probe circuit, the copper deposited initially on both the probe and the cathode at the same current density and eliminated the inherent time disadvantage of Hull's circuit.

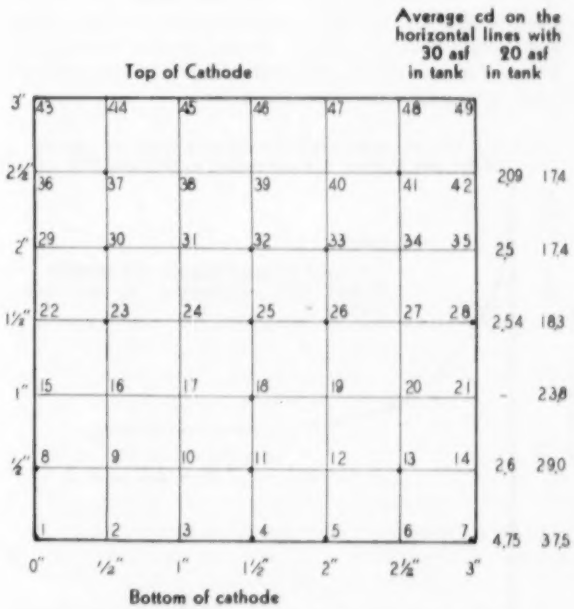
When switch (3) was opened, the milliammeter was placed in the probe circuit and the probe current returned through it to the cathode. The small internal resistance of the milliammeter reduced the probe current slightly and the meter registered a current slightly lower than the true value. For each meter reading (each value of current) the potential drop across the meter was constant and hence could be corrected by the calibration curve, where each milliampere reading was plotted versus the actual current density on the cathode. This relationship gave the actual current density corresponding to current density on the probe.

Three minutes were allowed for the system to come to a steady state. Since the meter reading was referred to a calibration curve, any appreciable time-interval could have been chosen, but it was found that three minutes were sufficient for the system to attain steady state operation.

This current-density meter is simple and inexpensive, requiring only a milliammeter and a SPST switch. The probe electrode may be used many times and still maintain its smooth surface. The single disadvantage of the meter is that it must be used in conjunction with a calibration curve.

DETERMINATION OF THE CATHODE CURRENT DISTRIBUTION IN THE CASE WHERE THE CATHODE IS SHORTER THAN THE PARALLEL ANODE

In this case, both of electrodes (0.020-in gage rolled copper) were 3 inches wide, but the length of the cathode was



The above average current densities were calculated from those given below:

Point	asf at point with 3 asf in tank	20 asf in tank
1	4.71	
4	4.76	37.5
5	4.69	
7	4.83	
8	2.70	
11	2.68	29
13	2.60	
18		23.8
23	2.58	
25		18.3
26	2.41	
28	—	
30	2.48	
32		17.4
33	2.51	
37	2.08	17.4
41	2.10	

Fig. 10. Current Distribution on cathode one-third the length of a parallel anode

3 inches and that of the anode was 9 inches. The anode and cathode were placed parallel to each other against opposite ends of the plating cell and were separated by a distance of 7¾ inches. The width of the plating cell was one-eighth inch greater than the width of the anode and cathode. The inside dimensions of the cell were 3⅛ in x 7⅞ in x 9½ in.

The current in the cell was adjusted to give an average cathode current density of 3 asf in one test and 20 asf in another test. The current density was measured at numerous points on the cathode with the aid of the probe electrode using the simplified circuit. The results of these measurements are summarized in Figs. 10, 11 and 12. In Fig. 10, the sketch of the cathode surface was cross-ruled and numbered with arabic numerals to indicate the position of the probe electrode during the tests.

In Figs. 11 and 12 the vertical distance in inches along the cathode was plotted along the abscissa, zero representing the bottom and 3 the top of the cathode.

The above case was studied to obtain data to check the results of a graphical method which was derived for the determination of the primary current distribution on flat parallel electrodes having the same width but different lengths. This graphical method was too tedious and cumbersome to find any practical application and for this reason was omitted from this article. In the one case investigated, it gave a current distribution corresponding to that obtained from the probe-electrode measurements.

Fig. 11. Plot of current density vs distance along the cathode of the case studied. Current density in tank was 3 asf

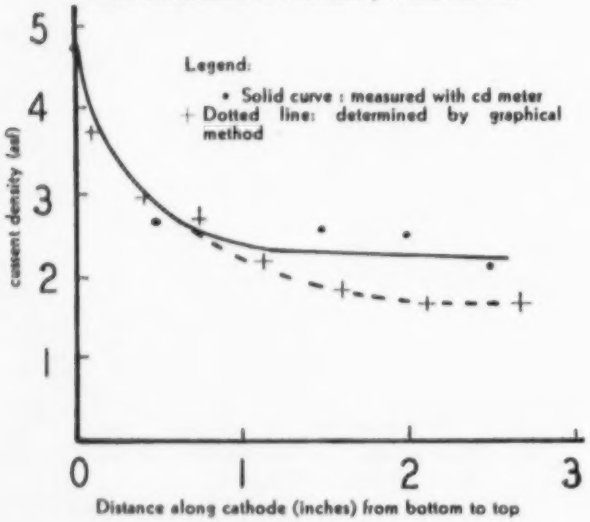
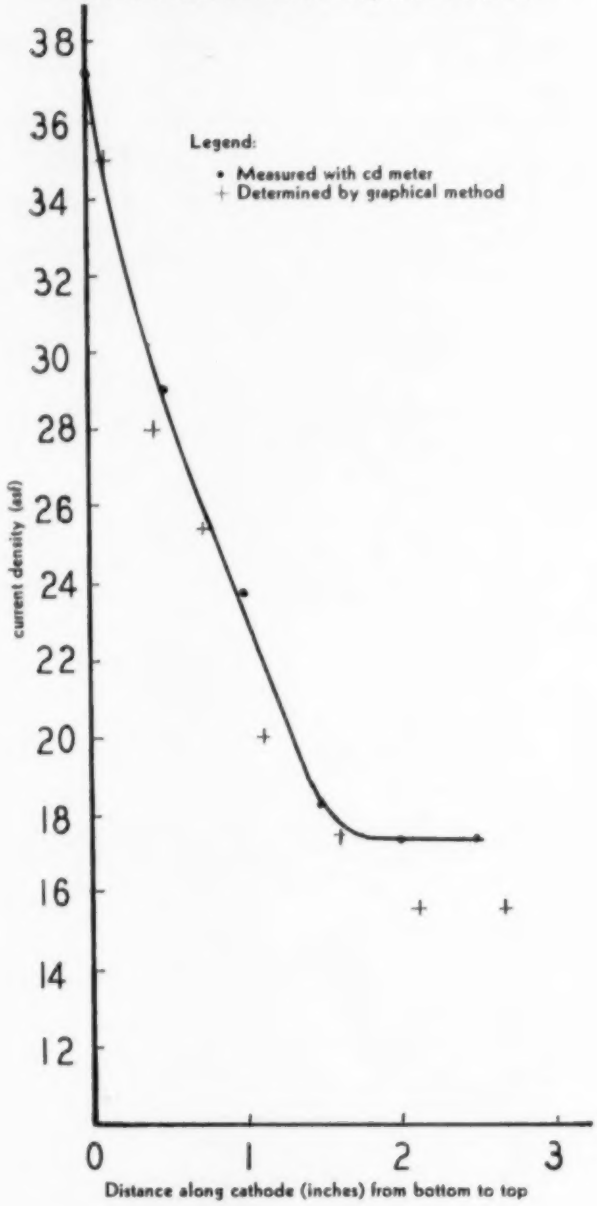


Fig. 12. Plot of current density vs. distance along the cathode of the case studied. Current density in tank was 20 asf



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[4]G. F. Kinney and J. V. Festa, "Current Density Distribution in Electroplating by Use of Models," Plating 41, 380-384 (1954).

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Notes On Experiments In Electrodeposition With Perfluorinated Acids

By

J. K. Taylor and A. Brenner

Whenever new acids become available which ionize strongly and form very soluble salts, it is of interest to determine their value in forming plating baths for depositing various metals. Within recent years, perfluorinated acids have become available. These acids, particularly the perfluoro aliphatic acids, acetic through butyric, have many interesting properties. The acids are strong and the salts are very soluble, some of them being quite soluble in organic solvents. Also the solutions of the acids have low surface tension.*

In an exploratory survey of the value of these acids for making up plating baths, the authors examined the behavior of two of them in a chromic acid bath and also studied the deposits obtained from nickel baths which contained only the salts of these acids, no boric acid being present. The results of these experiments lead to the following conclusion: (1) the acids are not effective as a replacement for sulfate in a chromic acid solution; (2) the nickel deposits have no unusual properties; they were harder than deposits from the Watts nickel bath but were not outstanding in this respect.

EXPERIMENTS IN ELECTRODEPOSITION

1. *Chromium plating bath*

The bath used was similar to a conventional chrome plating bath and contained 400 g/l CrO_3 with additions of various amounts of fluorinated acids instead of the sulfuric acid ordinarily used. The temperature of the bath was 50° C and a current density of 20 amp/dm^2 was used.

(a) Trifluoroacetic acid

The acid content was varied from 1 ml/liter to 35 ml/liter. The deposits obtained were dark, varying in color from gray to black with a metallic tint underneath. Deposits were very thin and the current efficiency was of the order of 0.1 to 0.2 per cent.

(b) Perfluorobutyric acid

The acid content was varied from 1 ml/liter to 20 ml/liter. The deposits were semibright. The current efficiency increased with increasing acid concentration and was 2.0 per cent for the highest concentration of acid used.

2. *Nickel plating bath*

(a) Nickel trifluoroacetate

A nickel bath consisting of 1 M solution of nickel trifluoroacetate was prepared in the following manner. Trifluoroacetic acid was neutralized with barium hydroxide and the nickel salt was prepared by adding nickel sulfate to the solution and filtering off the precipitated barium sulfate. The volume was then adjusted to give the required salt concentration. The solution of the nickel salt so prepared had a *p*H of about 3. Adjustment of *p*H to lower values was made by addition of the acid and to higher values by careful addition of a slurry of freshly precipitated nickel hydroxide.

The nickel was deposited on thin-walled copper tubing. The nickel anodes used were not attacked appreciably in this bath so that the *p*H increased during a run. Adjustments were made as indicated above.

*The surface tensions of trifluoroacetic acid and perfluorobutyric acid are 15.6 and 15.1 dynes per cm, respectively. Corresponding values for the 1 per cent aqueous solutions are 69 and 55, while molar solutions of their nickel salts have values of 52 and 33 dynes per cm, respectively.

SUMMARY OF RESULTS

TABLE I

Plate No.	Temp. ° C	cd amp/dm² *p*H = 2.0	Efficiency Per Cent	Hardness VPN*	Microstructure
A	25	2	46	257	fine
B	55	2	43	194	wide, coarse
C	55	5	71	239	wide, coarse
D	55	25	74	255	fine
E	85	25	100	192	coarse
F	85	5	71	251	best
		*p*H = 4.4			
G	25	10	95	364	elongated

TABLE II

Plate No.	Temp. ° C	cd amp/dm² *p*H = 2.5	Efficiency Per Cent	Hardness VPN	Microstructure
II	55	25	97	295	fine
III	55	5	90	272	fine
IV†	55	25	90	184	broad, columnar

All of the deposits showed good ductility. At *p*H values greater than 4, it was difficult to obtain nickel deposits, especially at high current densities. Electrolysis started normally but, after an indefinite period, a green insoluble basic salt deposited at the cathode.

(b) Nickel perfluorobutyrate

The plating bath was a 1 M solution of nickel perfluorobutyrate. The preparation of the bath was similar in all respects to the trifluoroacetate bath described previously.

All of these deposits were characterized by poor adhesion and either split or were easily peeled from the electrode. They were somewhat more brittle than those deposited from the trifluoroacetate baths.

3. *Trivalent chromium*

Several unsuccessful experiments were made in attempts to develop trivalent chromium baths using these fluorinated acids.

4. *Cobalt trifluoroacetate*

A small bath containing cobalt trifluoroacetate was prepared in a manner similar to that described for nickel. Semibright deposits were obtained at room temperatures, but no quantitative measurements were made of the operation of the bath.

John K. Taylor

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Abner Brenner

†Thick deposit.

*VPN, Vickers pyramid numbers, 250 g load.

THE APPLICATIONS OF POLAROGRAPHY TO THE ANALYSIS OF ELECTROPLATING SOLUTIONS

Rafael Diaz*

The purpose of this paper is to bring up to date the list of available literature related to the analysis of electroplating solutions by polarographic methods and to emphasize their advantages in many instances over other more firmly established, conventional methods.

SUMMARY

The principle in which polarography is based and its advantages as an analytical tool are briefly discussed.

The literature of polarography related directly to the analysis of electroplating solutions is reviewed and references are given covering the analysis of these solutions for major and minor constituents.

INTRODUCTION

The polarographic method of analysis was introduced by Heyrovsky[5] and his co-workers at Charles University, Prague, about 1922. It is an electrochemical method of analysis based on the study of current-voltage curves obtained when a solution containing an oxidizable or reducible substance is electrolyzed in a cell consisting of some form of a small, easily polarized electrode and one large, non-polarizable electrode. Under certain conditions, the voltage gives information on the nature of the reacting substance while the current observed is a function of its concentration. The theory of polarography is discussed at length by Kolthoff and Lingane,[6] Muller,[11] and others.[14]

Among the advantages of the method as an analytical tool are its speed, accuracy, and relative simplicity of operation. These advantages, coupled with the advantage of using only a small sample of the material to be analyzed, have made the method quite attractive to workers in many fields.

REVIEW OF THE LITERATURE RELATED TO THE ANALYSIS OF ELECTROPLATING SOLUTIONS

Extensive bibliographies of polarographic literature are readily available.[10,13] References to polarographic literature may be found in nearly all up-to-date publications in all scientific fields. A few of the papers having direct application to the analysis of electroplating solutions are briefly reviewed below:

In 1938, Sherrick[16] published a paper describing some of the various types of instruments commercially available, and the possibilities of their application in the analysis of electroplating baths for major and minor constituents. However, polarographic analysis was still in its infancy in this country, and was practically unheard of in the plating industry.

Zentler-Gordon and Roberts[21] have determined the copper and zinc contents of brass plating solutions in one analysis. They treat 1 ml of the solution with hydrochloric acid and utilize a supporting electrolytic composed of ammonia and ammonium chloride. Their figures show that the method gives results in agreement with the gravimetric values to within less than 1 per cent. Vyakhirev, [18] under somewhat similar conditions, claims an accuracy of 2-3 per cent.

Cadmium has been estimated according to the method of Szanto.[17] A sample of the plating solution is treated with concentrated HCl and evaporated to dryness. The residue is taken up in 1 molar KCl as supporting electrolyte, diluted to volume, and polarographed after gassing with N_2. No mention of the use of a maximum suppressor is made. The method is claimed to be more accurate than the volumetric ferrocyanide method and the time consumed may be reduced from 1½ hours to ½ hour.

Lead has been determined in lead plating baths[3] by making use of the wave obtained in a potassium nitrate medium. An aliquot of the solution is diluted to volume and made 1 molar in KNO_3 and 0.004 per cent in gelatin. The time required for a determination is just a fraction of that needed for analysis by the acid sulfate gravimetric method, and the results obtained agree within 2 per cent of the gravimetric values.

Nickel plating solutions have been the subject of more polarographic studies than those of any other metal. Belaya and co-workers[1] have developed procedures for the estimation of nickel, cadmium, lead, and zinc in nickel plating baths. These various elements are estimated as follows:

To determine zinc, 100 ml of the sample are treated with ammonia and dilute HCl to adjust the acidity to

*Chemical Laboratory, Minneapolis-Honeywell Regulator Company, Minneapolis, Minnesota.

the right value for the precipitation of zinc as the sulfide. After passing H_2S through the solution for 2 to 3 hours, the precipitate is filtered, dissolved in dilute HCl, and then 25 ml of 2N NaOH are added as supporting electrolyte. The volume is adjusted to 50 ml with water and a portion of the solution is polarographed after adding a small crystal of Na_2SO_3 to remove dissolved oxygen. The time required for a zinc determination is 4 to 5 hours instead of 11 to 12 hours required by other methods and a higher accuracy is claimed.

Lead and cadmium are determined on the same polarogram by dissolving 1 to 2 g of ammonium citrate in the plating solution to 25 ml. After removal of the dissolved oxygen with H_2 gas, the solution is polarographed. The waves of lead and cadmium appear in that order.

Nickel is determined in a 0.4M NH_4OH–NH_4Cl supporting electrolyte using a 1 ml sample.

The zinc impurities in nickel sulfate and nickel plating solutions can be determined polarographically. A method has been published[19] based on the preliminary separation of the zinc as zinc sulfide. The precipitate is then dissolved in 2N HCl, carefully neutralized with ammonia, and polarographed in a mixture of ammonium acetate and potassium thiocyanate as a supporting electrolyte. No gain in time is accomplished, but the method is said to be more accurate. The sulfate content of nickel plating baths by amperometric titration has been described by Vyakhirev.[20] Details of this useful branch of polarography may be found elsewhere.[7] The technique of standard addition is employed by Korshunov and Sazanova[8] for the estimation of copper and lead impurities in nickel electrolytes. In their procedure, 10 ml of the electrolyte are gassed with purified nitrogen or hydrogen to remove any dissolved oxygen (this is almost always a requisite in polarography) and the sample is polarographed. A definite volume of a standard solution of copper sulfate and lead nitrate is added and the polarogram is again taken. From the increase in the diffusion currents of the two ions, the volume of the solution, and the concentration of the standard solution added, the concentration of the copper and lead may be calculated. The time required for one determination is about 45 minutes. The relative error is quoted as ±8 per cent for copper in the range 10 to 15 ml/l and for lead in the range 5 to 20 mg/l. Recently, polarographic analysis has been employed by Petrocelli and Tatoian[12] for the determination of nickel sulfate, nickel chloride, and boric acid in nickel plating baths of the Watts type.

Tin has been determined[3] in alkaline plating solutions to within 2 per cent of the values obtained by iodometric titration. The procedure involves the conversion of the tin to the chlorostannate complex with perchloric acid and sodium chloride and it also involves the reduction of the stannic complex by using a small amount of gelatin as maximum suppressor. The time required for a determination is considerably less than that required for the volumetric method.

A supporting electrolyte composed of ammonia and ammonium chloride is employed by Korshunov and Sazanova[8] in their determination of the zinc content of zinc plating baths. After the necessary adjustments, the polarogram is obtained and the concentration of zinc established graphically as usual. Zinc can also be determined to within 5 per cent of the amount present[4] by employing a potassium chloride supporting electrolyte. This compared favorably with the controversial volumetric method employing diphenylamine as an inside indicator.

The simultaneous determination of zinc and chromium has been worked out by Spalenka.[16] In his procedure, 1 ml of the electrolyte is treated with 4 ml of 1:1 HCl, 2 ml of saturated sodium sulfite (to reduce the chromium from the sexivalent to the trivalent state), 5 ml of 0.5 per cent gelatin, 15 ml of 1:1 NH_4OH, and water to 50 ml. Oxygen need not be removed. Then the solution is polarographed at −0.8 to −1.7 volt. Two diffusion current steps are apparent; the first is due to a combination of the zinc reduction wave which coincides with the reduction of chromium (+3) to chromium (+2), and the second is due to the reduction of chromium (+2) to the metal. The chromium content is obtained from the last wave and the zinc content is obtained after subtraction of half the chromium value from the apparent zinc value.

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aes research project no. 14

THE INFLUENCE OF THE PHYSICAL METALLURGY AND MECHANICAL PROCESSING OF THE BASIS METAL ON ELECTROPLATING

Part II - Correlated Abstracts

By A. E. R. Westman and F. A. Mohrnheim

1. General Reviews, Discussions and Theories

The textbooks on electrodeposition of metals, even those of recent date, contain only rather meagre information regarding the effects of the basis metal upon the deposit.[57,150,156,158,172,176] The problems involve the study of crystal structure and of the metallic state.[29,55,62] The kinetic relations and the effect of surface properties as well as the formation and speed of growth of the deposit are discussed by M. Volmer[23] and T. Erdey-Grúz and M. Volmer[38] and R. Piontelli and G. Poli[124] on the basis of their theory of cathode processes. Such factors as lattice fields of force, electric field distribution, atom spacing in relation to formation and growth of deposit nuclei in electroplating as effects of the basis metals were discussed at the Third International Electrodeposition Conference in 1947 (R. Piontelli[148]) and by U. R. Evans and S. C. Shome.[166] G. E. Gardam[165] analyzes the difficulties of disposing of new atoms in an existing or new grain lattice which may arise from passage of ions through films or other obstructions at the required position on a solid metal. A more general discussion on the structure of metallic coatings, films and surfaces, types and classification according to the effects on the electroplate are given by C. H. Desch,[66] R. W. Meyer and Cl. C. Helmle[74] and E. H. Lyons, Jr.[143] A study of anode and cathode phenomena, shown by color photography, was given by F. K. Savage and P. R. Pfefferle.[130]

2. Nature of the Basis Metal

The particular cathode metal used in electrodeposition of chromium exercises a marked effect upon the plating range. This effect is more pronounced at the top limit than it is at the lower limit of the bright plating range (H. E. Haring and W. P. Barrows[17]). V. I. Arkharov and Z. P. Kichigina[116] found that chromium deposits on a Wood's metal cathode give a dull gray film of a cubic texture. Under the same conditions, 122° F and 465–929 amp/ft² (50° C and 50–100 amp/dm²) with Fe, steel or Cu cathodes, glossy Cr deposits of an octahedral texture are obtained. The deposits of Cr on Cd, Sn, Bi and Pb cathodes appear according to their texture to be of the type of transition stage between the deposits obtained on the Wood's alloy and the Fe or Cu.

W. G. Traub[6] showed that thin plates of Cu, brass, Au and Ag on zinc are diffused into the underlying zinc. W. F. Castell[60] found diffusion between electroplated copper deposits and the zinc in zinc-base die castings. H. E. Boyer[164] stated that electrodeposited metal can be shown to alloy with the basis metal during the plating operation and the ease or difficulty of plating can be related to the microstructure of the basis metal. Alloy metals in steel seem to slow the alloying action of plating in proportion to the degree in which corrosion is inhibited. Low carbon steel with a few pearlite grains (tiny aggregates of iron and iron carbide) surrounded by much ferrite (pure iron) is probably the ideal for electroplating; more so than a structure composed entirely of ferrite. The pearlite grains seem to nucleate chemical attack, thus promoting surface activity. Steel with approximately 1.00 per cent carbon content, where the microstructure is entirely composed of pearlite grains is inherently less active in an electroplating bath. This same steel after it has been fully hardened by heat treatment, but not drawn, has the particular structure of martensite. In this condition it is probably the least active and consequently the most difficult to electroplate satisfactorily. When this steel is drawn, the precipitation of secondary carbide tends to promote chemical action in the surface layers which is advantageous in plating. Free carbon or graphite flakes in ordinary gray cast iron (3 to 3.5 per cent of carbon) tend to inhibit an alloying action. Two to three per cent silicon, which is in most cast irons, also tends to inhibit chemical activity. Cast iron parts have been heated in a furnace at elevated temperatures under conditions which serve to reduce the oxides and burn out graphitic carbon in the surface layers at the same time. This method is most effective but the cost is usually high.

F. Fulforth[102] gave specifications to be followed in the purchase of strip steel for plating purposes. No. 3 cold-rolled strip steel which means to the mill a finish free from handling marks, scratches, rolled shear edges, darts, dirt and anything which could require polishing is recommended. The Temper "B" Rockwell of 45 to 55 for all ordinary press operation is good provided the mill has selected the properly cropped billets of the correct carbon and other constituent contents. As to the grain size, this subject is not so well known or understood either by the platers or the mills in its relation to finish. In general, the finer the grain size for any given hardness, the better looking bends and draws will be.

G. B. Hogaboom[27] stated and discussed the troubles due to slag inclusions and blistering met with in the electroplating of cold-rolled steel. J. D. Jevons[126] found that sheet metal may contain sub-surface pores or inclusions which fill with solution during plating, with the result that the plate subsequently peels or blisters. Some of these defects result from holes or slug inclusions in the original ingot from which the sheet was rolled and some result from rolling defects, such as rolled-in mill scale. If the crystal size of the metal is too large, a rough surface develops on deep drawing.

H. Gros[141] described the effect of the preparation and nature of the base metal and T. Dennison[151] gave only recently a description of the formation of mechanical defects in steel and how these defects appear in the finished hot- or cold-rolled sheet or strip (surface finish records and photographs of defective surfaces are shown).

W. A. Wesley and E. J. Roehl[121] found that the hardness of the deposit was markedly influenced by the nature of the basis metal.

3. Surface of the Basis Metal

(a) *Nature of the Surface*

G. Beilby[5] described in his book "Aggregation and Flow of Solids" the effect of polishing. Surface flow is produced by intense local heating causing fusion of surface irregularities, which are then smeared over the surface to form the Beilby layer (F. P. Bowden and T. P. Hughes[89]). Numerous investigations by X-ray and electron diffraction analyze this particular surface structure.[9,14,20,31,48,55,59,67,69,73,92,108] W. Boas and E. Schmid[26] studied the effect of grinding and polishing on metal crystal faces with Laue reflection X-ray diagrams and show that the polished crystal has a fine-grain sur-

face layer with recrystallization. This film of less than .00059 in (0.015 mm) thickness is followed by an intermediary zone 0.0063 in (0.16 mm) thick, partly deformed. The thickness of the layers depends somewhat on the relative orientation of the crystal to the direction of polishing and on the nature of the metal.

The thickness of the Beilby layer produced and described by H. G. Hopkins[68] is about 1.18 micro in (30 Å). There is a gradual increase in crystal size below the polished surface and at 3.94 micro in (100 Å) below the surface the crystals are still extremely small, about 5 to 6 atoms in the edge. The nature of polish was first thought to be amorphous and to resemble a supercooled liquid or a vitreous liquid[49,50,91] but L. H. Germer[51,52] proved that the two diffuse rings produced by electrons scattered from polished metal surfaces are no evidence for the amorphous state of the Beilby layer. Experimental results are presented to show that polished surfaces are at least partially crystalline.

H. Lowery and R. L. Moore[44] described and discussed methods of measuring the optical constants of polished metals and H. Lowery, H. Wilkinson and D. Smare[68] found that the absorption coefficient, upon the removal of successive thicknesses of disturbed layers, rises from its value corresponding to a mechanical polish, reaches a maximum after the removal of a depth of 1.18 micro in (0.0003 cm) and then decreases. The refractive index decreases suddenly upon the removal of a small thickness and then remains constant.

S. Dobinski[79] gave evidence of the formation of an oxide layer on a Cu surface polished in air.

(b) *Activation of the Surface*

The trouble experienced in plating nickel with chromium is attributed to a low hydrogen overvoltage, an unclean surface and a tendency for the surface to passivate (J. B. Cuthbertson[25]). "Passive" nickel plate may be activated by immersion in acidulated hypochlorites, chlorine water and acidulated iodine in potassium iodide. H. S. Lukens[18] calls attention to the necessity of activating both steel and nickel prior to chromium plating to minimize the formation of trivalent chromium. G. E. Gardam,[34] A. W. Hothersall[38] and D. Wood[107] recommend immersion and cathodic processing methods on nickel, chromium and stainless steel for obtaining adherent electrodeposits. W. M. Tucker and R. L. Flint[103] utilized the Hull cell as a quantitative device in a re-study of the reluctance of certain cathodes to accept chromium deposits. It was observed that neither copper nor steel were acutely sensitive to methods of surface preparation.

(c) *Cleaning and Etching of the Surface*

The various methods of cleaning available are described and the importance of thorough cleaning of the basis metal is stressed by many authors.[19,66,118,125,155,162,165,184] H. E. Boyer[161] stated that oxide films on the basis metal will retard or halt the alloying process, and the film must be removed by pickling, blasting or other means. The easier an oxide film can be removed and prevented from reforming, the easier the plating operation will be.

K. Gebauer[121,127] investigated the structure, adherence and brightness of hard chromium deposits on Al and its alloys in relation to pre-etching and eventual deposition of interlayers. In the case of direct chrome plating it was found that, as a rule, crystal growth starts from only a relatively few nuclei since the surface of the articles to be electroplated is never electrochemically uniform. A crystal aggregate is formed from each nucleus observed as flat bud on the surface of the deposit. A uniform roughening of the basis metal is necessary to obtain anchor point for the chrome deposit.

4. Microgeometry of the Basis Metal Surface

A. M. Portevin and M. Cymboliste[75] illustrated by photomicrographs that the geometry, chemical and crystalline condition of the cathode surface affect markedly the condition of the deposit. The influence of surface irregularities due to scouring, cataphoresis, cracks and holes is shown. A. Phillips and W. R. Meyer[99,100] described the small-scale geometrical condition of the cathode, that is, the presence of projections, holes or crevices of the order of 0.0005–0.005 inch will influence the crystal orientations of the electrodeposit. In some cases, pits in the basis metal will induce the formation of nodules in the deposit as a result of the tendency of normal crystal growth to persist, and because there will be localized higher current densities at the edges of the pits. Small projections above the surface of the cathode may also influence the structure of the deposit by inhibiting diffusion of the plating solution in the vicinity of the projection, and thus causing an increase in the amount of the basic matter co-deposited with the metal. Examples of multiple deposits have been examined in which the large-scale geometry of the cathode was superimposed upon the small-scale effects of projections and crevices, and the resulting structures were oriented towards a plane bisecting the two large planes of orientation of the basis metal. The intersection of two or more trends of crystal orientation will cause a slight decrease in the size of the crystals. A. W. Hothersall[168] stated that although the effects of the basis metal are usually confined to a small thickness of deposit, effects produced by the geometry of the surface persist for much greater thicknesses and may lead to misinterpretation of the structure of the deposit.

5. Crystal Orientation and Continuation

A. K. Huntington[1] first called attention to the fact that the microstructure of a copper deposit could be influenced by the structure of the copper upon which it was deposited. G. B. Hogaboom[2] predicted this effect of the basis metal. He noticed inter[4] in photomicrographs published by W. Blum[3] that some of the copper deposit crystals were continuations of the crystals in the copper basis metal. This observation was confirmed by W. Blum and H. S. Rawdon[8,9] and by A. K. Graham.[10] Per K. Frölich, G. L. Clark and H. Aborn[12,13] deposited Ni and Pb on Pt, Ni and Al and found that, under certain conditions, reproduction of the underlying structure in the deposit occurs. Greasing the electrodes, cleaning and preliminary preparation, whether the basis metal is cold rolled or cast, all influence the structure of the deposit. Ni is deposited in completely unoriented arrangement upon Al because of the oxide layer. G. Tamann and M. Straumanis[20] confirmed that the crystal orientation of a Cu deposit depends upon the character of the surface. On a polished surface the deposit is very fine and its orientation bears no relation to that of the cathode. If the cathode has been etched, the crystal orientation of the deposit is identical with that of the electrode, if the c.d. is not too high. F. Foerster and K. Klemm,[21] C. W. Stillwell,[22] W. A. Wood[24] and A. W. Hothersall[29] brought more evidence and the latter states that such reproduction of the basis metal structure may occur even with dissimilar metals that vary appreciably in lattice structure and spacing. W. Blum, A. O. Beckman and W. R. Meyer[117] gave the general principle that the closer the lattice constants of the coating metal and the basis metal, the longer the continuation. M. Cymboliste[61] found that irregularities in orientation due to the basis metal prevent good adhesion and favor cracks. G. I. Finch, H. Wilman and L. Yang[144] stated that the substrate as well as the bath influences the crystal growth at the cathode involving three states. The adhesion of the deposit is good if the substrate influence in the initial layer is not counteracted by the bath influence. The other properties of thicker deposits are, however, determined by the bath conditions. During the first stage in the growth of electrodeposits, the orienting influence of the basis metal is paramount. The second is a transition stage and, in the third, the deposit assumes a crystal habit which is governed by the conditions of deposition.

I. Chiout[16] studied electrolytic crystal growth on a single crystal copper sphere used as cathode. With current densities between 46.5 and 158 amp/ft² (0.5 and 1.7 amp/dm²) the cathode grew as a single crystal. Above and below these limits the deposits were polycrystalline. W. Cochrane[74] deposited Ni, Cu, Zn, Cd, Ag,

Cr and Co on etched single crystals of Cu and examined them by the electron diffraction method of G. P. Thomson. In all cases, Zn and Cd showed the patterns characteristic of the polycrystalline metal. The other metals, when deposited at sufficiently low c.d.'s, were oriented. The critical c.d., above which polycrystalline deposits were formed, varied from metal to metal, the higher limits corresponding to cases in which there is a close agreement between the lattice constants of deposit and base. Thin layers of Ni and Co, whose lattice constants are very close to those of Cu, are deposited exactly like the Cu crystals with the lattice constant of Cu. D. J. Evans and M. R. Hopkins[120] deposited the usual face-centered cubic nickel under various plating conditions, on electropolished single crystals of body-centered cubic iron. The results emphasize the importance of the compositions of the plating solution since some of them produced only polycrystalline deposits even under various plating conditions. A. W. Hothersall[70,168] states that continuation of a basis metal structure is possible (a) when deposit and basis metal belong to the same crystal system, over a range of differences in lattice parameters from 2.4 to 12.5 per cent; (b) when deposit and basis metal belong to different systems. Tin continues the microstructure of Cu, and Cu that of β-brass. A considerable amount of distortion or change in the growing lattice of the deposit by the inclusion of foreign elements is possible without marked interference with crystal growth. Adhesion of electrodeposited coatings may be due to their ability to continue the crystal lattice of the metal upon which they are deposited. The effect of the grain structure of the basis metal is usually confined to a thickness of deposit too small to be visible under the microscope. Beyond this small thickness, the structure of the deposit is governed solely by the conditions of deposition. G. I. Finch and C. H. Sun[92] measured by electron diffraction the extent of the influence of the substrate on crystal orientation and found it to be approximately 40 micro in (1000 Å), except for Cu or Ni on Fe where at a thickness of 2 micro in (50 Å) normal orientation was observed. Poor adherence was noted by a rough test, when the deposit was unoriented on an oriented electrodeposited substrate. In Ni deposits on Cu substrates, G. I. Finch and A. L. Williams[92] found that crystal size and orientation gradually depart from that of the substrate until, at deposit depth of 1,200 micro in (30,000 Å) and generally less, the Ni deposit has a crystal size and orientation characteristic of the deposition conditions but quite different from those of the substrate. Crystal boundaries of the substrate are reproduced throughout the depth of the deposit and falsely suggest a continuity of crystal size and orientation throughout the deposit.

The orientation as well as the structure of the deposit may be also influenced by various factors other than the basis metal.[11,12,41,42,122]

P. A. Jacquet[97] electrodeposited a thin coating of copper on electrodeposited metal and revealed a curious "dendritic" structure by anodic etching which appeared to determine the mode of distribution of the first, thin, subsequent deposit. An attempt was made to relate the structures observed to the crystal orientation of the basis metal and also to the concept of the existence of active centers on a cathode (M. Vollmer[22]). At low current densities, the original distribution of the deposit is not homogeneous, some of the grains constituting preferred points for the insertion of the metallic ion where crystallographic planes cut the surface.

A. G. Quarrell[101] showed on electron diffraction patterns from thin electrodeposited films that crystallization of the first deposited layer caused extra rings and bands. This first layer of nickel consists of closely packed hexagonal crystals having an axial ratio approximately equal to 1.63, the effective atomic radius being the same as in the normal face-centered cubic form. As deposition proceeded, the structure changes during the growth of the metal film. The transition occurred gradually and was not an atomic rearrangement occurring when a critical film thickness was reached. H. R. Thirsk[115] stated that face-centered cubic metals in films formed on active or inert substrates produce in initial stages of growth a special type of structure which does not persist as the film thickens or is heated.

M. v. Laue[93] and G. Menzer[104] describe twinning in electrodeposits, which is due to the formation of octahedral facets on the deposit surface, while the deposit itself had the same orientation as the substrate lattice.

G. L. Clark, G. Pish and L. E. Weeg[124] described a stepwise plating technique for studying the interfacial structure and tabulated 17 interface structure combinations. Adherence was due to three types of bonding: (a) mechanical, in which the deposited metal forms its own characteristic lattice from the beginning and clings to the faults of the basis metal surface; (b) solid solutions, in which the first-deposited atoms enter the lattice of the basis metal, the solid solution forming a transition layer; and (c) pseudo-basal isomorphism, in which the deposited metal through a few transitional layers forms a crystalline arrangement that simulates and extends the type and dimensions of the basis metal. Under best operating conditions, bonds of great strength of all three types are possible and are commonly observed in commercial practice.

A. T. Steer[150,151,161,175] studied the influence of surface behavior on the characteristics of electrodeposits by a new etching technique. Surface conditions produced by mechanical working and their effect on subsequent electrodeposits are shown by microphotographs. The presence of a flowed noncrystalline surface layer on a basis metal is held to cause strain and poor adhesion of a subsequent deposit.

6. The Polish of the Basis Metal

(a) *Mechanical Polishing*

O. Erbacher[80] states that mechanical abrasion gives rise to local solubility cells. This leads to an exchange of metallic atoms with ions of the same metal and to multiple atomic layers. C. L. Faust[119] discussed the action of polishing and said: "'Dry' wheels possibly plow through the metal producing loosely adherent, torn metal fragments, which cause gas pitting and roughness of plate. The milder lubricated cutting of the grease wheel removes the fragmentary metal and does not introduce more. In addition, the metal surface is less severely worked and therefore consists of structurally stronger metal. Fragmentary basis metal and/or severely worked basis metal does not produce bonds as strong as those to 'true structure basis metal'." The Ollard test gives a good picture of how a steel surface of fragmentary and broken crystal structure has a greatly reduced bond strength for nickel deposition. In such tests, bond strengths of 30,000 to 70,000 lb/in² (2,100–4,900 kg/cm²) are secured, whereas nickel deposited on the "true metal surface" of a mild steel of 100,000 lb/in² (7,000 kg/cm²) tensile has a bond exceeding 90,000 lb/in² (6,300 kg/cm²) which is the strength of the nickel plate. Three recent papers[106,107,169] described in detail testing methods, physical properties and strength and ductility of electrodeposited metals.

The importance of the nature of the surface of the basis metal in relation to the finished deposit is emphasized by many authors (e.g., 29, 38, 111). W. L. Pinner[111] investigated different polishing procedures by profilograph examination of the basis metal surface and showed that the finer abrasives had reduced the average depth of 90-grain scratches from 0.00005 in to 0.000015 in. G. A. Lux[122,129] determined the amount of metal removed in a single pass under the polishing wheel. This was dependent upon grain size and wheel pressure.

R. D. Miller and H. Du Rose[117] evaluated the buffability of nickel deposits formed on the different steels in various states of surface finish and came to the conclusion that the effect of the basis-metal finish on the final lustre is nil, except for sand-blasted and unpolished steel.

(b) *Electrolytic Polishing*

P. A. Jacquet[95,71,72,84,85,96] described methods of electrolytic polishing and compares properties of metallic surfaces polished mechanically and electrolytically. After mechanical polishing there exists below the Beilby layer a more or

less thick zone of micro-crystals having no resemblance to the normal crystals of the metal alloy. The properties of mechanically polished surfaces are bound up with this special structure and are not specific to the metal or alloy. Electrolytic polishing exposed the crystal faces, and thus facilitates the interpretation of phenomena with electrodeposited metals.

M. Kawasaki and N. Kuwabara[170] plated buffed and electropolished surfaces of Cu, brass, carbon steel, and Ni with Ni or Cr and compared the finished layers. They found that electrolytically polished surfaces were less porous and more resistant to tearing than those on the buffed surfaces.

(c) *Polish and Pores*

W. M. Phillips[88] related porous deposits to roughly polished surfaces, a statement which was confirmed by A. W. Hothersall and R. A. F. Hammond[103] who found a rough condition of the surface to be the most important means of porosity in nickel deposits formed on unpolished steel. M. Schlötter and H. Schmellenmeier[108] cited experiments to show that the porosity of Sn and Ni deposits on Cu is proportional to the roughness of the Cu surface. Also A. Ghazunov and L. Jenicek[125] found that electrolytic deposits were more porous and the thickness of plate varied more when the basis metal surface was rough. Finally, U. R. Evans and S. C. Shome[105] wrote that surface contours of the base metal, rather than hydrogen bubbles or other surface impurities, appear to be the main cause of pores.

7. Stresses in the Basis Metal

C. Marie and N. Thon[20,21,45] found that metallic deposits have in general a tendency to contract or expand, depending on the nature of the cathode, condition of the surface, etc. Thus with a solution of copper sulfate, there is expansion of the deposited Cu on bright Pt but contraction on dull Pt. When Ni is deposited on cathodes of Pt, Ag, Cu, Ni, Fe, Al and Ta, the stress is of the order of 0.0145 lb/in^2 (10^3 dynes/cm^2) and depends on the flexibility of the support, being at a maximum on a rigid support. The stresses are stronger on dull than on polished surfaces, but are particularly weak on Al and Ta. J. Billiter[48] discussed the stresses which appear in a deposit during the course of electrolysis and states that they are probably dependent on the crystalline form of the deposit, especially that of the first layer. R. Wagner and G. B. Hogaboom[102] pointed out that strains do have an effect on corrosion. A. W. Logozzo[128] recommended that steel parts to be hard chromium plated should be properly heat treated prior to plating. Strains are thus relieved and the deposit is less likely to crack in service. A. Willink[48] holds that the cause of failure of chromium-plated tools and dies is due to the fact that the base metal has been deformed beyond its elastic limit. A. Glazunov and L. Janicek[125] state that electrolytic deposits are more porous and the thickness of plate varies more when the basis metal has internal strains.

8. Corrosion Protection of the Base

(a) *Influence of Plate Thickness and Undercoating*

The Joint Committee of the American Electroplaters' Society, the American Society for Testing Materials and the Bureau of Standards[40] reported on the preparation of specimens for exposure tests of electroplated coatings on steel. The American Society for Testing Materials[156,170] stated that identical coating systems, within the range of the simple and composite coatings studied, behaved similarly on a high carbon steel base and on the high-yield-strength alloy steel tested. A program for the investigation of "Effect of Surface Finishing of Nonferrous Basis Metals on the Protective Value of Plated Coatings" was offered by G. J. Kahan.[146]

W. Blum, W. C. Strausser and A. Brenner[59,77,112] stated that the protective value of nickel coatings is dependent principally upon thickness. The methods used for preparing the basis metal and the variations made in the composition of the Zn- or Cd-plating solution for electrodeposition of zinc and cadmium coatings on steel have much less effect than the thickness on the protective value of the coating. For equal protection the Ni coat for steel should be 0.00085 in. for die castings 0.0007 in and for copper and brass 0.0002 in. Copper under nickel on steel and on die castings does not give the same protection as the same thickness of nickel. A. K. Graham[101] reported that a thin strike of iron 0.005–0.05 mil under nickel deposits (3–4 mils) had no beneficial effect on behavior in the hot-water test. Scratch-wire brushing of a nickel-plated surface flows the metal over minute capillary openings and improves corrosion resistance.

E. A. Anderson and C. E. Reinhard[102] found that failures by corrosion of Cu-Ni-Cr-plated castings after five years of service in urban locations were due mainly to insufficient plate thickness. Off-grade casting compositions also caused failure. A minimum total plate thickness of 0.0012–0.0015 in was necessary to give perfect service for five years.

G. A. Lux and M. Berdick[129] and G. A. Lux and W. Blum[127] found on outdoor exposure and porosity tests on a special steel that wide variations in the operations and in the contours of the steel prior to plating had no significant effect on the protective value of the plated coatings. H. A. Pray[160] too found that there is no significant difference between the rate of weathering of a given coating system plated on high-carbon steel (SAE 1090) and on low-alloy cold-forming steel (SAE 9112). The thickness of copper undercoat, whether the undercoat was buffed or unbuffed, and even the type of nickel plate, appeared to be secondary in their effect.

(b) *Influence of the Roughness of the Base*

The findings of W. M. Phillips,[88] W. L. Pinner,[114] Toledo Branch, American Electroplaters' Society[126] and H. Thielsch and G. Stroman[176] were that the quality of the plate is found to be dependent upon the surface finish of the part prior to the plating process.

H. E. Ricks[124] found that the corrosion protection offered by hard chromium plating is proportional to the thickness of the chromium plate and to the surface smoothness of the panel before plating. For a given thickness of chromium plate, greater protection is obtained on a smooth surface than on a rough-surfaced basis metal.

(c) *Replacement of Polishing by Other Smoothing and Levelling Procedures*

Surface analyzer charts of various numbers of surface finishes commercially used for plating were given by G. W. Jernstedt[169] in "Levelling with P. R. Current Plating." By using periodic-reverse current, a great deal of buffing and polishing may be eliminated. "Smoothing action as a mechanism in bright nickel plating" was described by G. E. Gardam.[155] K. S. Willson and A. H. Du Rose[163] stated that semi-bright nickel deposits have a pronounced smoothing effect over basis metal defects.

A. W. Hothersall and G. E. Gardam[119] showed that the luster of thin (0.0001 in) deposits of bright nickel was highest on a smooth fine-grained surface. On coarse-grained surfaces the deposits had to be 0.0004 in. thick in order to appear fully lustrous.

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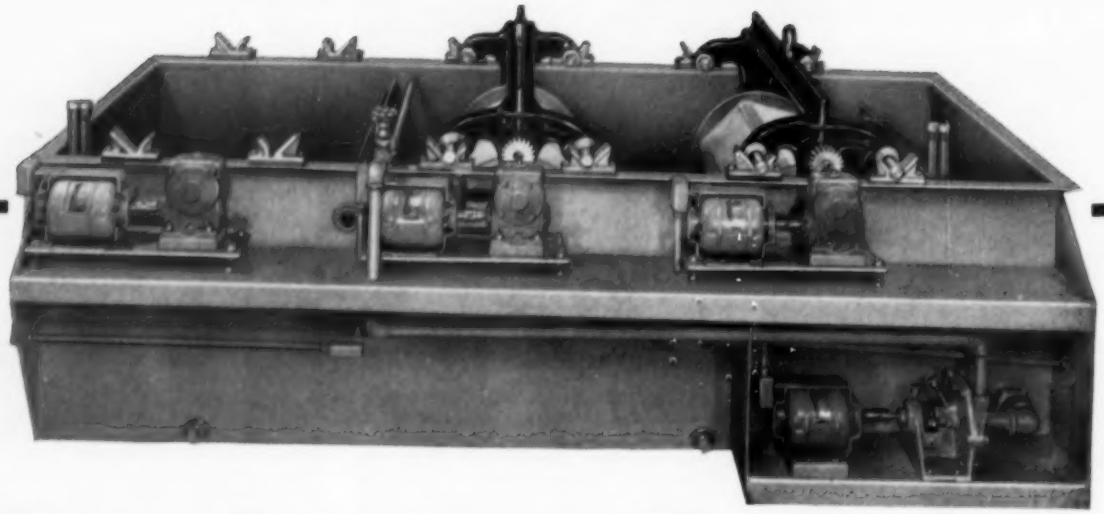

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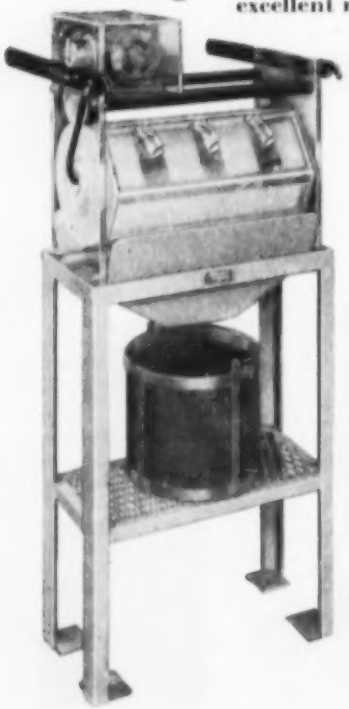

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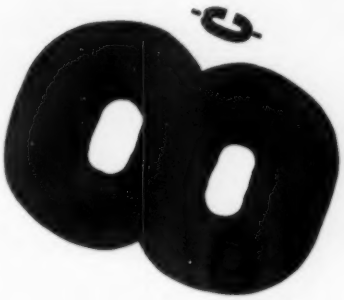

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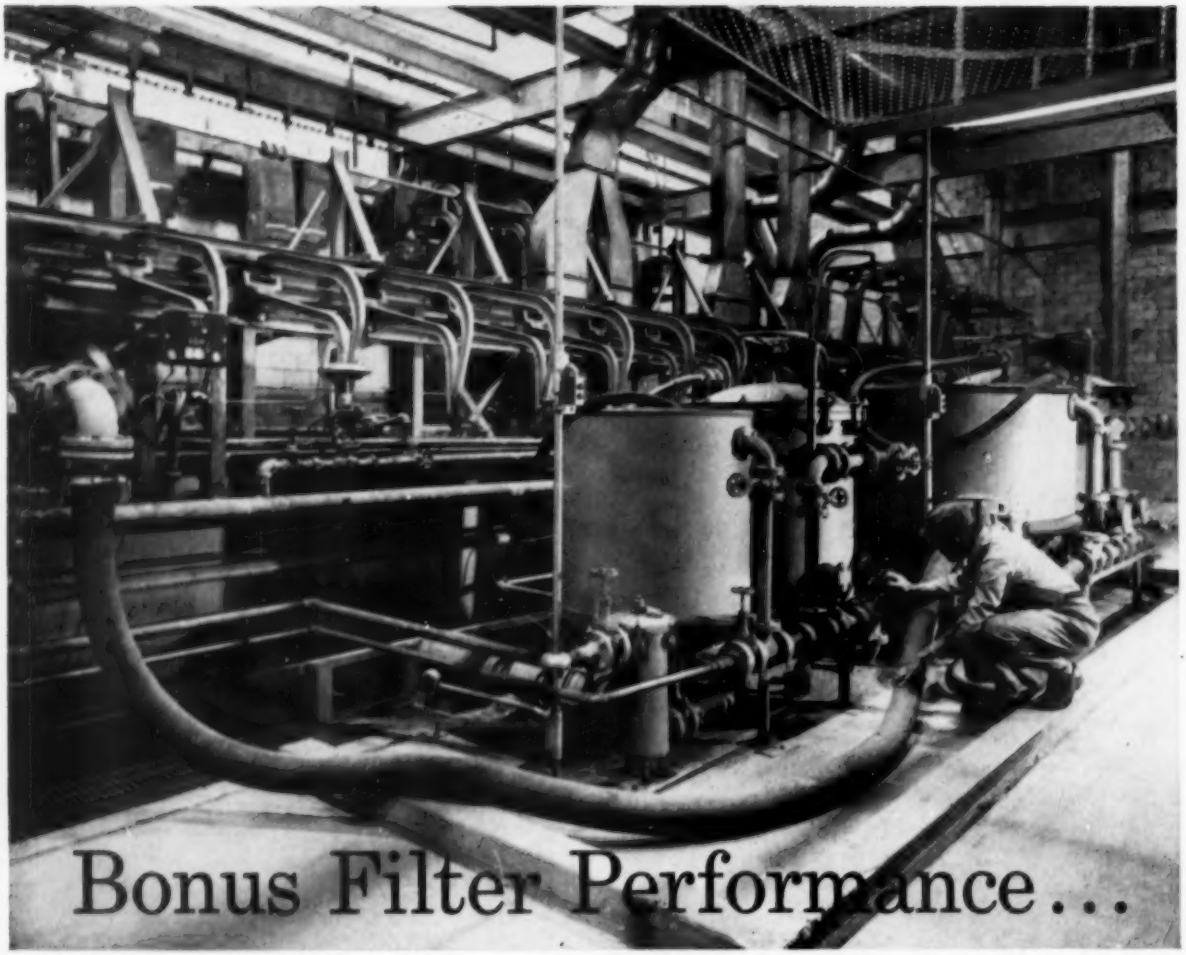

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Adequate turnover in the continuous filtration of the nickel dip and neutralizer solutions by the INDUSTRIAL filters assures dependable clarity. Furthermore, the air-wash cleaning feature eliminates the opening or dismantling of the filter for cleaning. The removal of the cover is necessary only for replacing the filter cloths or for periodic inspection—a great time and labor saver. It is this overall bonus performance that accounts for the universal use of INDUSTRIAL filters with the vitreous enameling processes.

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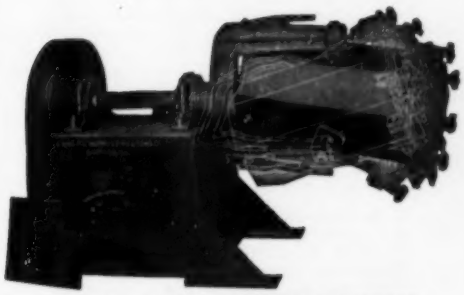

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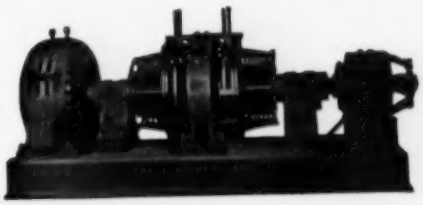

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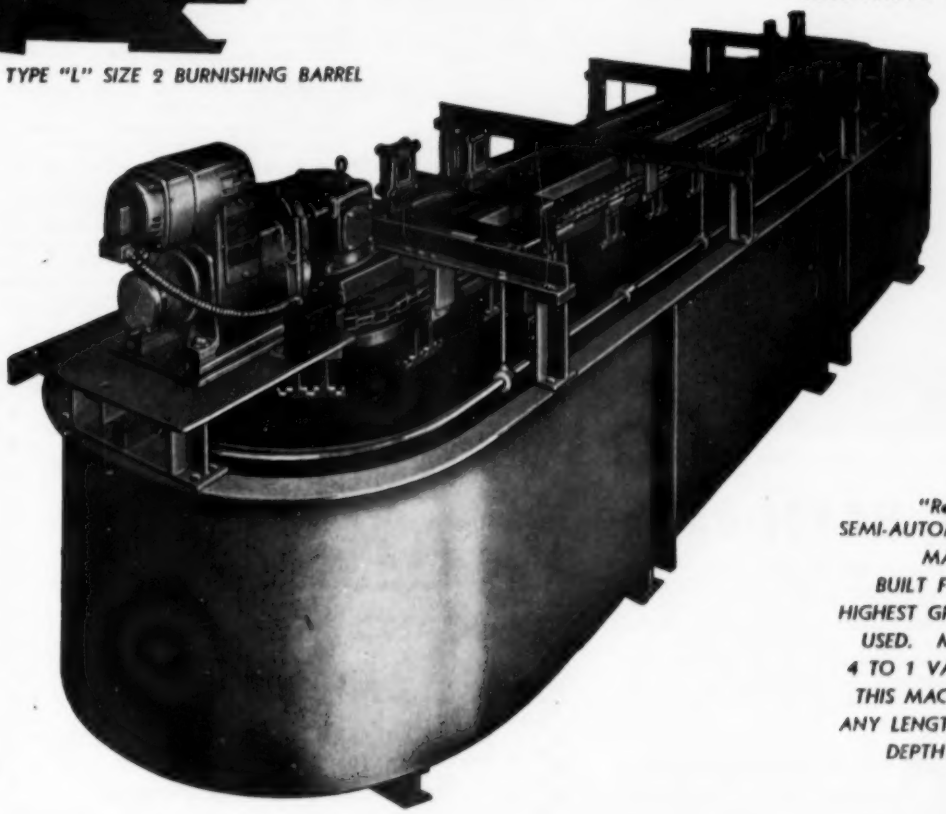

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The companion volumes, **"Dielectrics and Waves"** and **"Dielectric Materials and Applications."**

Written by Arthur R. von Hippel, "Dielectrics and Waves" reflects the developments that include modern electrical engineering along with physics and chemistry. Dielectrics, as Dr. von Hippel points out, is a word identified not with a narrow class of so-called insulators, but any nonmetal, or even metals as a boundary case if their interaction with electric, magnetic, or electromagnetic fields is under consideration. Covering both the macroscopic and molecular approaches, the book affords an understanding of the phenomena of polarization, magnetization, and conduction.

"Dielectric Materials and Applications," edited by von Hippel, is the collaborative work of twenty-two experts from science, industry, and government, and is designed to ally the research worker, development engineer, manufacturer, field engineer, and the actual user of "non metals." This volume goes into the phenomena of polarization, magnetization, and conduction as they may be described macroscopically and interpreted from the standpoint of molecular theory. The methods for measuring these phenomena, the properties of present-day materials, and the application of dielectrics to equipment as well as their use in devices are the other salient points discussed. The Tables of Dielectric Materials of the Laboratory for Insulation Research at the Massachusetts Institute of Technology are included in this volume.

"Dielectrics and Waves" contains 284 pages and is priced at $16.00 to nonmembers, $13.60 to members. A 438-page volume, "Dielectric Materials and Applications" is priced at $17.50 to nonmembers, $14.90 to members.

How may I estimate the validity of instruments for measuring roughness and irregularities of the surfaces of solid materials?

This and many questions of interest to the mechanical field are answered in the published proceedings of the Fifth National Conference on Standards, held in November at the Hotel Roosevelt, New York.

The 100-page volume, just off the press, is entitled, "Standards for a Strong America." It contains 40 papers on a wide variety of subjects, including purchasing, agriculture, quality control, color TV, electrical standards and world trade, safety, architecture, company standardization, forecasts by technical and business press editors, and ASA Annual Meeting and Award Ceremony addresses. Now available from the American Standards Association at $3.00 per volume.

How to Use Portable Power Tools by Maurice Reid. 200 pages. Thomas Y. Crowell Co. $2.95.

In view of the recent rapid trend toward mechanization of all hand labor, the book is designed as an up-to-the-minute manual for the building and construction trades, maintenance crews, industrial production, wood and metal working shops. It describes all types of standard portable electric tools, newly developed machines, and numerous attachments for specialized jobs. Step-by-step instructions on uses and "tricks of the trades" show the craftsman how to turn out more skillful work twelve times faster and with less fatigue than by old hand methods. 180 instructive photographs make this a practical basic guide for all manual workers.

Symposium on Effect of Cyclic Heating and Stressing on Metals at Elevated Temperatures (ASTM Special Technical Publication No. 165). 184 pages. $3.00 to non-members, $2.00 to members.

It has been long realized that much, if not most, engineering use of metals at elevated temperature involves periodic changes in temperature or stress or both. However, the engineer has available for most metals only constant stress and temperature data for design purposes. This poses the question of how changes in stress or temperature modify the constant stress and temperature behavior of metals and thus the designs based on such behaviors.

This Symposium is intended to cover those situations involving relatively slow changes in stress or temperature or both. In practice many such changes are aperiodic, and much of the experimental work covering this Symposium uses periodic variations.

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Tests thicknesses from 0.0001 to 0.015 inch. Each individual gage is separately calibrated to National Bureau of Standards thickness plates, resulting in an accuracy to 10% for thicknesses over 0.0002 inch. As simple to use as an automobile tire gage, the Pocket Handi-Gage may be used on the production line or in the laboratory. It's perfect for use as a "Go, No-Go" thickness gage at the plating tank or spray booth.

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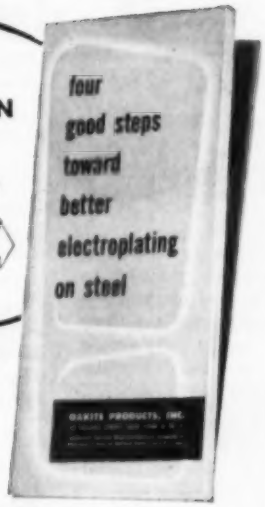
See page 6



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- ¶ Which costs more: good electrocleaning or poor electrocleaning? *See page 4.*
- ¶ How can cleaning costs be reduced 33% while plating quality is being improved? *See pages 7 and 8.*
- ¶ What are four easy ways to improve the average rinse tank? *See page 10.*
- ¶ What rinsing fault is "an invitation to trouble" in the plating of high-carbon steel? *See page 11.*
- ¶ Why is it better to clean steel with reverse current than with direct current? *See pages 12 to 14.*
- ¶ What causes hydrogen embrittlement during electrocleaning? What is the remedy? *See pages 15 and 16.*
- ¶ One part chromic acid in 1,000,000 parts of cleaning solution—does that spell D-A-N-G-E-R? *See page 16.*
- ¶ How can an ordinary electrocleaning cycle be transformed into an exceptionally good cycle? *See Cycle E on page 23.*

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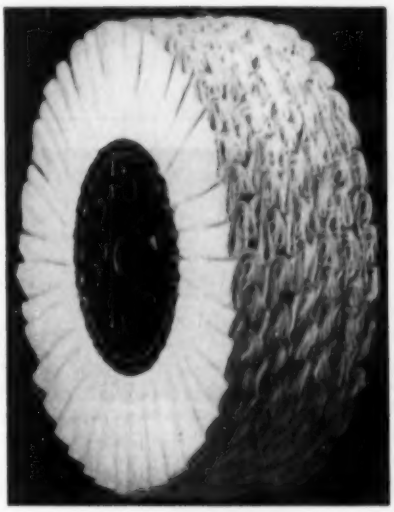

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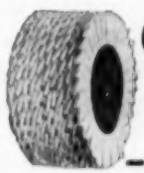

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February 28, 1955

Sirs:

Thanks for the nice job on my article in the February issue of Plating. Several of my colleagues who are contributors to scientific journals commented most favorably on its composition. The cover, too, is a constant source of admiration. The twinkle in your eye is quite discernible in the heading you conceived; it brings a smile and a nodding sense of approval. The January cover was also excellent.

I would appreciate your making note of a correction for the school from which I received my degree. It should have read Brooklyn Polytechnic Institute.

Sincerley,
Louis Sebota

February 8, 1955

Sirs:

We are in possession of your January issue of Plating and would like to compliment your Mr. Arthur W. Logozzo on his excellent story, "Plating Racketeers Invade Industry."

Here in the Motor City they are called Gypsies and are currently plaguing us off and on again. Some of our best customers have been approached by them and it is only our timely intervention that has saved them from the embarrassment of being taken in by these racketeers.

We would appreciate your permission to copy this article for distribution here in Detroit, or if you have additional copies of this story, we would like to purchase and distribute them.

"We" . . . hope to see some more of your fine stories. It is articles of this type which will soon drive these fellows from our doorstep.

I hope that I may have the pleasure of hearing from you soon.

Sincerely yours,
Modern Hard Chrome Service Co.
Marc A. Haynes
General Manager

(Editor's Note: The National Office of the AES mailed a broadside release to principal newspapers of the U. S. recently warning the public against these "gypsies.")

March 3, 1955

Sirs:

It was certainly a pleasure to see the new office setup and meet the personnel of the AES Headquarters.

The physical aspects of both equipment and personnel looks very good. It certainly looks like a real high-grade business establishment and a headquarters that the entire membership can be proud to call their own. I'm sure when the present personnel gets thoroughly oriented to the idiosyncrasies of a large and widely spread out organization such as the AES, we'll have a national office that will be the envy of all technical societies.

Best regards to all.

Sincerely,
Arthur W. Logozzo
President, Nutmeg Chrome Corp.
(Past President, AES)

March 2, 1955

Dear Sir:

Referring to the Mail Box of the February Issue of Plating (p. 127), Mr. Robert Pinner has commented on the omission of several English and other foreigh publications from the List of Reference Publications published in Plating. Mr. Pinner's suggested references are good ones, but any such list can be criticized for omissions.

We wish to point out that the NBS list from which Plating took its list was intended for use in answering inquiries from laymen and the general plater. Inclusion of more foreign publications would be superfluous since they would not be readily available in the average American library.

Fielding Ogburn
Assistant Chief
Electrodeposition Section
Division of Chemistry
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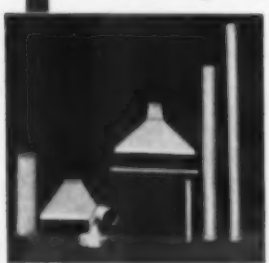

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Branch News

BALTIMORE-WASHINGTON

The February meeting of the Baltimore-Washington branch was called to order by president **Benderly** at the Marling House in Baltimore.

Following a short discussion **Raymond Stricklen, Jr.,** was elected to the office of delegate. **Fielding Ogburn,** the retiring delegate, was elected an alternate. **Theodore Katan,** Box 351, Baltimore 3, Maryland, and **William E. Kilgore,** 834 20th St., Newport News, Virginia, were elected to membership.

With business finished, librarian **Jules Horelick** introduced the speaker, **A. G. Ken Chamberlain,** Wilmington Plastics Company, who spoke on the "Uses of PVC in the Plating Industry." Chamberlain presented his subject very well and illustrated it with items selected from a table filled with curious articles made of PVC. He explained to us the advancements that have been made in the forming and fabricating of this material, its easy adaptability and its amazing resistance to a high percentage of conditions to which plating equipment is subjected.

CARL H. THIEDE,
Secretary

BRIDGEPORT

The annual "Old Timers Nite" of the Bridgeport branch was held on February 11 at Viking Hall, Bridgeport, Conn.

Smorgasbord à la Lillberg arranged by a Swede, prepared by a Swede, served by Swedes to whet the appetites of a conclave of the United Nations was the main attraction.

Bill Ehrencrona, our genial host, did himself proud with the arrangements. **George Monroe** entertained and mystified many of us with his expert card manipulations.

Favorite card games were in progress, as well as the cup that cheers, making the evening a huge success.

BOB PARKER,
Secretary

BUFFALO

The February 4 meeting of the Buffalo branch was held at the Markeen Hotel in Buffalo, N. Y.

Three applications for membership were referred to the board of managers. Eight members were suspended for nonpayment of dues.

C. F. Paulson of the Permutit Co. gave an illustrated lecture on the "Application of Demineralized Water in the Plating Room."

Following a lively question and answer period, a rising vote of thanks was given **Paulson** for his excellent discussion.

ERIC G. SAMPSON, JR.,
Secretary

CAPITOL DISTRICT

Forty-three members and guests met Monday night, February 7 for a roast beef dinner at Panetta's Restaurant, Menands, N. Y. **Hubert M. Goldman,** Enthone, Inc., spoke on "Oxide Coating and Coloring of Steel and Other Metals." Goldman's talk covered a broad field very thoroughly. Slides were used as visual aids to illustrate his many processes. After a question and answer session, the branch gave Goldman a rising vote of appreciation for his educational talk.

President **Infield** called a business session that was highlighted by brief reports from **W. O. Naylon,** chairman of the nominating committee and **E. Berical** pinch-hitting for chairman **N. Searles** of the annual outing committee.

New members elected to membership were: **Zygamond Nash, Merle Shaw,** and **Don McMullen.**

President Infield then appointed the following members to the law committee: **Ed Wheeler,** chairman; **Chet Klimeck, J. J. O'Connor** and **Bob Hill.** This committee was charged with revising tentative by-laws to conform with present practice and National requirements.

Harold Harper, local representative of Austen Fletcher, Inc., Binghamton, N. Y., was host for refreshments.

P. D. CALLAHAN,
Secretary

NOTICE OF PROPOSED AES CONSTITUTIONAL REVISION

On January 20, 1955, the AES Executive Board authorized the following proposed change in the Constitution to be submitted before the Supreme Society in Cleveland in June:

"ARTICLE VIII. OFFICIAL PUBLICATIONS

Section 1. Official Journal: delete "one-half the regular subscription price" and add "two dollars ($2.00)." This sentence, therefore, should read: "Each member of the Society in good standing shall receive a copy of the official journal for two dollars ($2.00) paid to the Society out of his annual dues."

ARTICLE V. FINANCES

Section 3. Per capita tax: delete "part" and "at one-half of the regular subscription price" and add "two dollars ($2.00)." This sentence, therefore, should read: "From the annual dues of each active member and sustaining member there shall be paid to the Supreme Society a Per Capita Tax of five dollars and seventy cents ($5.70), two dollars ($2.00) of which shall be used to pay the annual subscription to the official journal of the Society and one dollar ($1.00) of which shall be paid into the research fund."

Above revisions have been submitted to the AES Law Committee and reviewed by that committee, in accordance with Part III, Article I, Sections 2 and 3 of the Constitution.

The purpose of this revision is to permit any increase in PLATING subscription price *to non-members* without increasing members' price. Present ruling does not permit such an increase without also increasing members' subscription.

CENTRAL MICHIGAN

The January meeting of the branch was held at the Meadow Lark Inn, Jackson, Mich.

Following a delicious chicken dinner served family style to the twenty-five members and guests present, the meeting was called to order by president **Fred Stuckenburgh.** After a few opening remarks by the president the meeting was turned over to **F. I. Young,** the librarian, for introduction of **C. H. Sample,** the principal speaker of the evening.

Sample, a representative of the International Nickel Company, took as his subject, "Corrosion Behavior and Protective Value of Electrodeposited Coatings." Sample also presented a series of slides to illustrate his discussion.

Several new members were accepted into membership in the branch. They are as follows: Messrs. **A. B. Covey, H. C. Everett, H. E. Kratzer, E. S. Spraker; N. J. Lenneman, B. N. Sisco, D. D. Trafelet, C. Wilson, A. L. Simpson.** All of these gentlemen are affiliated with the Oldsmobile Division of GMC. The signing into membership of these new men was due to an intensified membership drive carried out by the 2nd Vice-President of the branch, **R. L. Carter.**

The Central Michigan branch of the AES extends its sincere appreciation to C. H. Sample and to the International Nickel Company, Inc., for providing an interesting program.

The Central Michigan branch held their annual Ladies Night Program at the Hotel Porter on February 8.

Approximately one hundred members and guests enjoyed an especially delicious roast prime rib of beef dinner. During dinner a string trio supplied a variety of selections making the dinner hour very enjoyable.

Following dinner the branch president, **F. Stuckenberg,** introduced the feature entertainment for the evening, **C. Cairy.** Cairy proved to be a memory expert and

Branch News

proceeded to amaze the audience with a great number of feats of memory with numbers, words, letters, etc.

As a fitting climax to a full evening, the ladies were each presented with a very nice gift.

The Central Michigan branch wishes to express its appreciation for the cooperation of the sponsoring organizations.

R. W. Boos,
Publicity

CHICAGO

On February 11 the monthly meeting of the Chicago branch was held at the Western Society of Engineers.

At the business meeting, the chief order of business was a discussion of branch exhibits and an addition to the slate of nominees for branch officers. **C. McComb** was nominated for second vice-president of the branch, along with **Jim Connelly.**

As is the custom at Chicago branch meetings the regular speaker was preceded by a panel discussion of members' questions on plating problems. Members of this month's panel of plating experts were: **Don Chiz,** Poray, Incorporated; **Marion Longfield,** Pheoll Manufacturing Company, and **Matt Dassinger,** Nestor-Johnson Manufacturing Company.

At the conclusion of the question period, **R. D. Miller** of the Sharonville Division of the Electric Auto Lite Company gave an excellent presentation on two topics of great interest: buffing, and the deposition of multiple layers of nickel.

Miller first discussed the buffing of bumpers at his plant. He traced the history of accumulation of problem from the plater's point of view as bumpers increased in complexity from the fairly simple shapes of pre-war years to the complex and massive designs of today. In addition, he discussed the progress which has been made through the years in buffing compositions, buffing techniques, and plating baths.

Miller's second topic had to do with the application of multiple layers of nickel on nickel. It was pointed out that such deposits provide resistance to corrosion superior to that of nickel applied in the conventional way as a single layer. The multiple deposits described by Miller were applied without an intermediate activation step.

To obtain a copy of Miller's talk or those of other speakers contact **Paul Glab,** Secretary, Chicago branch, 882 N. Paulina St., Chicago 22, Ill. Price per copy is one dollar.

Another step forward was taken by the plating industry in Chicago with the dedication of a new plating laboratory at the Illinois Institute of Technology. Speakers at the affair were: **John Rettaliata,** president I. I. T.; **Ralph Owens,** Dean of Engineering; **Robert Giesel,** chairman, C.E.P.I.; **Joseph Andrus,** class instructor.

Chicago branch speakers and their ladies are cordially invited to attend the April Ladies Night Meeting which will feature installation of officers for the coming year and a special program and favors for the ladies.

The 43rd Annual Educational Session and Banquet of the Chicago branch AES, held at the Conrad Hilton Hotel, was an outstanding success. Librarian **Russ Haar** and the banquet committee are to be congratulated on a job well done.

The day's activities began with the showing of a color film: "The Editor of Product Finishing Eyes Japan" just prior to the educational session by **Ezra Blount,** editor of Product Finishing.

The educational session was begun with a paper by **W. B. Coleman,** supervisor of Application Research, Victor Chemical Works, who spoke on: "The Applications of Phosphates for Metal Cleaning Purposes." Coleman's presentation was both interesting and very informative as indicated by the number of questions from the floor.

The second paper on the program was presented by Ezra Blount, whose subject was: "A Survey of Organic Finish Application Methods."

The final paper on the program was presented by **C. F. Nixon,** head of the Electrochemistry Department, Research Laboratories Division, General Motors Corporation. Nixon's topic was: "Plating for Out-of-Door Durability." Nixon gave a survey of exhaustive research being done by his company in this field. He also

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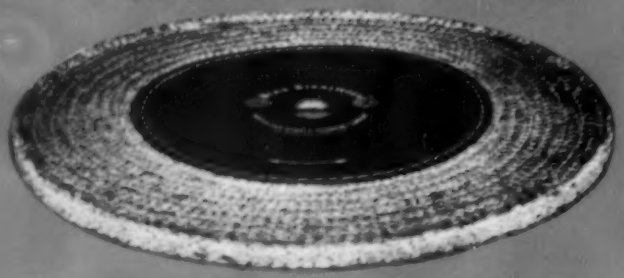
Produced from top grade sisal fibre, H-VW-M Sisalweev Sections represent a step forward in cutting and polishing wheel efficiency for severe operations on drawn, stamped, or cast ferrous and non-ferrous metals.

With a broad range of adaptability to many polishing and buffing room operations, they are responsible for increased production and substantial savings in time and operating costs. Oil-impregnated sisal cloth, tightly woven and heavily compressed in the manufacturing process, is the supple and sturdy backbone of all sisalweev sections. Two styles are available—bias cut and full disc.



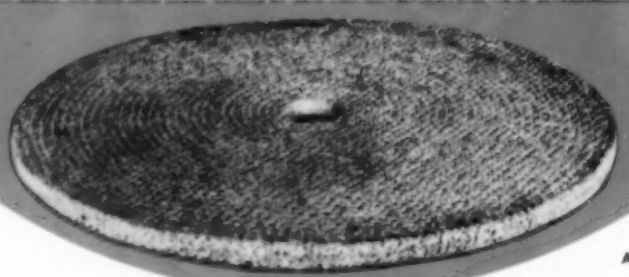
Bias Sisalweev Section with fibre-board center.

BIAS SISALWEEV* SECTIONS

An improved product, these sections have a longer life and provide more even finishes as a result of their special construction. The sisal cloth used in their makeup is cut *on the bias* and sisal fibres emerge at the contact edge of the buff at approximately a 45° angle. The other end of each strand is anchored deep in the hub of the section. Wearing evenly, this design outlasts any other for heavy-duty cutting.

Each section has its own sturdy fibre-board center —no special hubs or flanges are required. Sections are approximately ⅜" thick, made from 8 plies of sisal fabric. Outside diameter sizes are 12", 14", 16", and 18", with sewing spacings of ⅛", ¼", and ⅜". Centers are available 5" or 7" in diameter.

The sewing process is of primary importance in developing this long-wearing product. Extra-heavy thread is used and sections are sewed under great tension. The outside row of stitching is made close to the periphery to inhibit fibre separation.



A Full Disc Sisalweev Section showing the solid sisal construction.

FULL DISC SISALWEEV SECTIONS

Presenting a mass of strong, abrasive, and tough fibre ends, the contact surface of Full Disc Sisalweev provides an excellent cutting medium where difficult buffing conditions are involved. The thread stitching, which functions as a binding agent for the layers of fibre, is sewed spirally from the very edge of the arbor hole to within approximately ⅛" of the periphery. A latex treatment can be provided which anchors individual fibres, extending service life.

Full Disc Sisalweev Sections are made in all diameters from 6" to 24". Standard thickness is ⅜". Sewing spacings range from ⅛" to ½".

H-VW-M Bias and Full Disc Sisalweev sections are designed to be used with H-VW-M compounds for best results. Detailed information regarding the best type of compound for specific operations will be supplied on request, or ask for Bulletin Co-102.

*U. S. Pat. No. 2,642,706

Sisal Buffs

BINDERIZED**
SISALWEEV SECTIONS

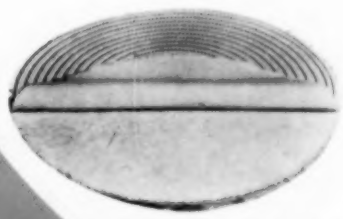
Binderizing is the unique H-VW-M impregnation applied to various buffing tools, increasing their service value by an average of 30%. The entire buff section is thoroughly impregnated with the same binder materials used in buffing compounds.

Applied to either Bias or Full Disc Sisalweev Sections, Binderizing produces a number of outstanding results in addition to increasing their durability. Through this new H-VW-M process, the relatively low affinity of sisal fibre to compound has been greatly increased, improving composition adherence and saving on excessive re-applications of compound during use. "Breaking in" time is eliminated. The strength and suppleness of the fabric is improved with this internal lubrication and the operation is cooler and the cutting deeper.

Binderized Bias and Full Disc Sisalweev Sections can be used in every application for which untreated sisal buffs have been designated, and with all of the advantages and savings which have been outlined. In addition, more severe cutting jobs can be undertaken because of the nature of the improved product. The range of adaptability of Binderized sisal buffs is therefore much broader, emphasizing their long-term economy.

**Patent pending

SISALIN SECTIONS***
the combination of buffing and polishing wheel



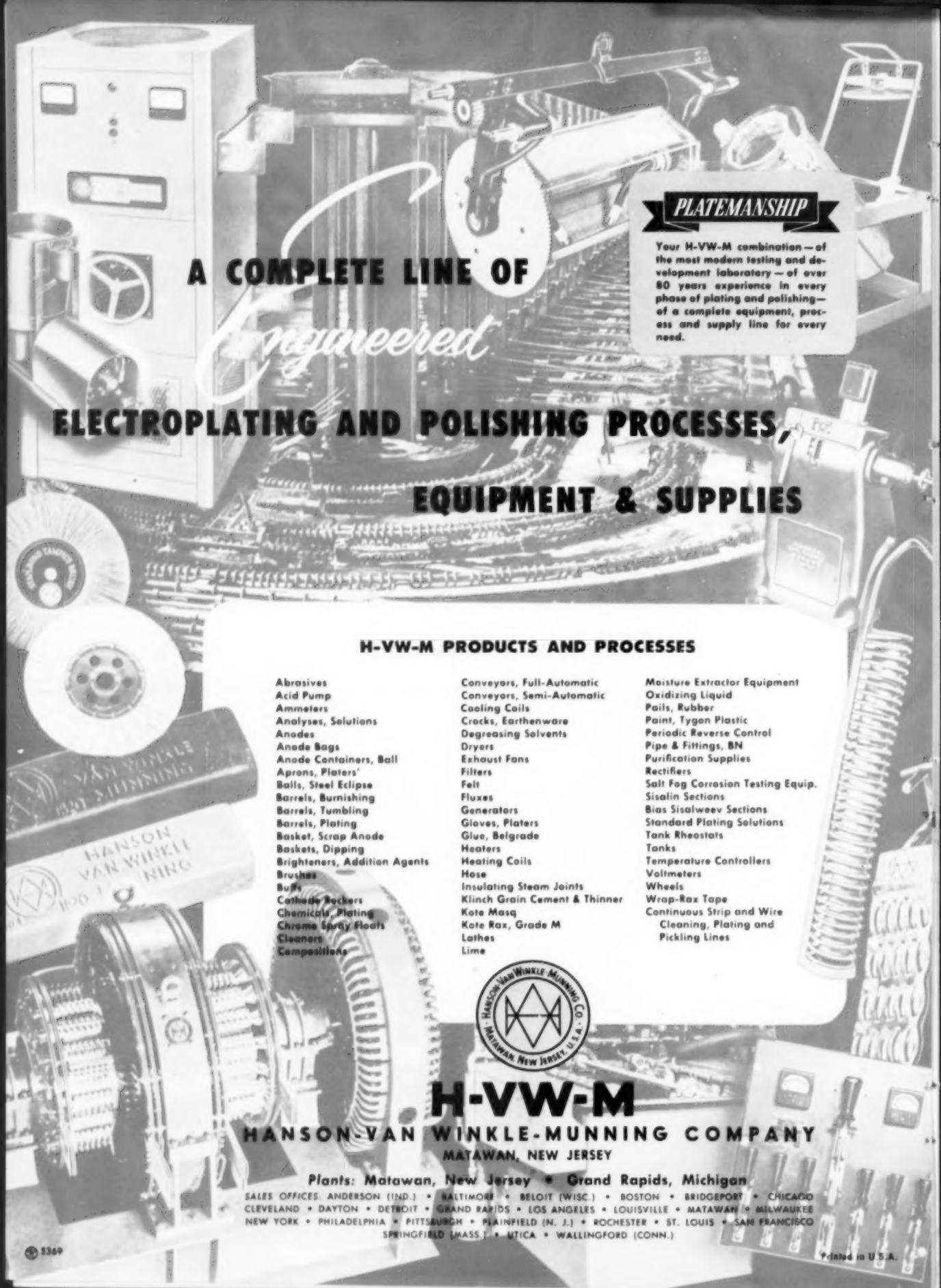
Sisalin Section showing muslin ply and melted sisal ply, alternated.

Used in finishing articles made from drawn, stamped, or cast ferrous and non-ferrous metals. Particularly well suited for buffing steel surfaces before nickel and chrome plating, and equally efficient at high or low speeds. A special treatment, #30, can be added for improved stiffness and cutting property. Available diameters range from 6" to 24" with 1/8"; 1/4", 3/8" or 1/2" sewing. Sections are 3/8" thick.

***U. S. Pat. No. 2,108,985

When ordering Sisalweev or Sisalin Sections, specify:

1. Outside Diameter
2. Thickness
3. Arbor Hole
4. Spiral Sewing (1/8", 1/4", 3/8", 1/2")
5. Diameter of Fibre-board Center (Bias Sisalweev only)



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Chrome Spray Floats
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5360

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Branch News

indicated the effect of variables in the plating cycle on the corrosion protection obtained with plated coatings on automobile hardware.

The group reconvened in the Main Ballroom to enjoy the lighter side of the day—a delicious dinner, a fine show, and dancing to the music of Lou Breeze and his orchestra.

In addition to the regular attenders, we were very pleased to note the number of out-of-town guests who attended our meeting. Among those we saw were **A. P. Munning** of New York; **Dick Saltonstall** of Udylite; **Ed Bowerman** of Sylvania Electric; **P. Peter Kovatis,** Managing Editor; **A. Doria,** Editor; **H. George Burnley,** Advertising Manager, PLATING; AES Executive Board; AES Research Committee; **Earl Serfass** of Lehigh University; **John** and **Walter Lockerbie** of Goshen; **Jerry De Grazia** of Valparaiso and many others.

The banquet may best be summed up as follows: "A good time was had by all."

J. KUDERNA,
Publicity Chairman

CINCINNATI

The meeting on February 23 was attended by 34 members and guests.

President **Gordon** made appointments to the Permanent Tri-State Committee; these appointees being **Ezra Blount** and **Dick Evans.**

A nominating committee for the Election of Officers was appointed, consisting of **Carl Truman, Robert Miller** and **Bill Albohn.**

President Gordon appointed the following as delegates to the National Convention in Cleveland in 1955: Delegates: **Bill Young, Chuck Wise, Roy Critchfield;** Alternates: **Robert Miller, Bill Gordon, Russ Waters.**

Announcement was made that **Ed Roof** had been appointed research finance chairman for the branch.

A committee was appointed to make plans for our annual picnic to be held this summer. **Charles Foertmeyer** is chairman, assisted by **John Hoover** and **Art Gerada.**

Because of the conflict with the Tri-State Regional Meeting in Columbus, Ohio on March 26, it was moved, seconded and passed by the membership that elections for the following year be held at our April meeting.

The name of **Robert E. Wiedemann** was presented to the membership for admission to the Society. Those members present indicated their approval.

The speaker for the evening was **C. H. Sample** of the International Nickel Co., New York City, N. Y. Sample showed a series of colored slides, comparing the corrosion resistance of various metals such as zinc, cadmium and lead. In addition there were some slides prepared on corrosion protection of copper, nickel, chrome coatings.

Following a rather lively discussion of many aspects of corrosion, a film, "Corrosion in Action," which had been prepared by the International Nickel Co., was shown.

After the meeting, refreshments were sponsored by the Globe Chemical Co.

L. J. HOWALD,
Secretary

CLEVELAND

On Friday, February 4, the Cleveland branch was entertained by the Carling Brewing Company of Cleveland, who graciously invited the members to a plant tour and social gathering in their Show Room at the Central Office Building.

Charles East, acting as our host for the evening, described the difficulties of converting the former Peerless automobile factory into a modern and efficient brewery. He also gave us a description of the various steps required in the manufacture of their products and then led our group of approximately forty-five people through each department of the plant.

It certainly proved to be a most interesting inspection trip for everyone present and certainly no finer indorsement of Carling's could be made by a more enthusiastic amateur vocal group than our local platers.

MORT VAN LOAN,
Assistant Librarian

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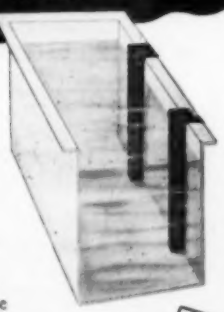

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Branch News

COLUMBUS

The February meeting of the Columbus branch was held at Battelle Memorial Institute.

Reports on the Annual Tri-State Regional Meeting were given by **Bill Neill**, program chairman; **Ed Bride**, entertainment program chairman; **John Beach**, ticket chairman; and **Bill Safranek**, chairman.

Librarian **Bill Neill** introduced the speaker of the evening, **H. T. Yee**, engineer, Ohio Department of Industrial Hygiene, who spoke on "Industrial Health Hazards." Yee was assisted by **Cordier**, who operated several testing instruments. After a question and answer session, the speaker was accorded a round of applause.

Doug Gordon and **Larry Noll** repeated their request for pledges for the Central Ohio Technical Foundation.

MICHAEL FARR, JR.,
Secretary-Treasurer

DAYTON

The Tenth Annual Educational Session and Dinner-Dance was held February 19 at the Dayton Biltmore. A luncheon at 12 noon was attended by officers, committee chairmen, speakers, the honorary chairmen and their wives. The educational session got under way with twice past president of the National AES, **Clarence Van Derau** serving as honorary chairman. Three excellent papers were given: the first, "Chemistry of Electroplating" by **Dr. R. B. Saltonstall** of the Udylite Corp.; the second, "Soldering" by **E. R. Bowerman** of Sylvania Electric Products; and the third, "Electroforming and the Manufacture of Phonograph Records" by **Dr. A. M. Max** of the RCA Victor Corp. Sixty-three members and friends present expressed their appreciation by responding with a rousing vote of thanks.

The evening session got under way with the dinner starting at 6:30. The floor show and dancing until the wee hours followed. In all, it was one of the most successful affairs given by the Dayton branch. We are also indebted to the many suppliers for their help in making it a success.

We recently lost one of our members, **John Haddick**, who transferred to the Chicago branch, but we gained a new member, **Richard McDowell**, of the Roto-Finish Co., who transferred in from the St. Joseph Valley branch.

R. M. CLINEBENS,
Secretary

DETROIT

The February meeting was held at the Wayne Room of the Hotel Statler, Detroit. This was a joint meeting with the Plating Institute of Michigan.

The meeting opened with a Pan American World Airways film, "Wings Over Ireland."

Joe Gurski welcomed **Kurt McKinney** back after his confinement in the hospital. Joe also announced that **Jim McGarrigle** had pictures of the Christmas party and anyone could place an order if they wanted one.

Bob Racine introduced three new applicants, who were accepted into the branch as members.

Lee Morse, membership chairman, announced that the Detroit branch membership now totaled 660. Lee then introduced **Wright Wilson, Jim Dunn, Herb Head** and **Robert Bolton**, all members of this committee. He made an appeal for new members, and requested each member to do his utmost in soliciting new applicants.

At this time the president, **Joe Gurski**, opened the meeting asking for additional nominations from the floor for the officers of the 1955–1956 society year. He did not receive any nominations and accepted the nomination committee's suggestions as follows: President, **Lee Morse**; 1st Vice-President, **Howard McAleer**; 2nd Vice-President, **Bob Racine**; Secretary-Treasurer, **Ed Hubis**; Educational Chairman, **Doug Thomas**; Board of Managers, **Fred Olmstead**.

Fred Olmstead gave a short but very concise report on the Plater's Institute and the work they are doing. He then

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Branch News

introduced **James Muller.** Executive Secretary, of the Plater's Institute.

Two guests from the Milwaukee branch were **Nick Servatious** and **Bob Iler** of Modern Plating, Freeport, Ill. Nick is making a tour with his Ford which has 24K gold trim.

Muller introduced the guest speaker of the evening, **B. Magruder** from Wayne University, School of Business Administration. Magruder's talk, "Cost Analysis for a Purpose," attempted to give the plater a picture of problems involved with cost. He pointed out several cases where cost as the accountant sees it was not the true cost picture. Magruder's talk was followed by a short question and answer period.

PATRICK J. DRISCOLL,
Publicity

HARTFORD

The regular branch meeting was held at the Bond Hotel on February 21 with approximately 49 members and guests present. Preceding the meeting a colored movie entitled "Fishing for Fun" was shown. Following the movie **Ralph McCahan** reviewed the paper, "An Electrochemical Method for Evaluating Plated Coatings" presented at the last National Convention.

The guest speaker for the evening was **Dr. Alfred Henning,** research and development engineer from H. N. Hartwell and Son, Inc., whose subject was "Use of Rigid Polyvinyl Chloride as a Structural Material to Combat Corrosion."

Dr. Henning reviewed the early history of plastics describing the thermoplastic and thermosetting types. The polyvinyl chloride type was discussed in detail because of it many uses in the chemical and plating industries to combat corrosion. It has good resistance to acids and alkalies but its temperature limit is about 140° F. It is one of the few plastics that are rigid enough to be used for construction work such as pipes, duct and fume hoods, liners for steel tanks, etc. It can be welded, cemented, heat formed, etc. Slides were shown pointing out the many applications for this structural material.

The technical chairman for the evening was **Ralph McCahan.**

STANLEY PLATOZ,
Secretary

HOUSTON

The February meeting of the Houston branch was called to order on February 15 by President **E. L. Whitmore, Jr.,** at the Ben Milam Hotel. Fifteen members and five guests were in attendance.

Gene Combs, General Chairman of the 42nd Annual Electroplaters Convention, discussed plans for the forthcoming convention, then gave an interesting talk on chromium plating.

LOS ANGELES

The February meeting of the Los Angeles branch was held on February 9 at Rodger Young Auditorium, with seventy-six members and guests present.

The membership chairman introduced five candidates for membership and one new member was elected. Three members, elected in January, were initiated.

Chairmen of various committees for the 25th Annual Educational Sessions and Dinner-Dance gave reports on the progress of preparations for this event. It was announced that the affair would be held Saturday, March 19 at the Ambassador Hotel and that all committees were functioning satisfactorily.

A motion was carried to the effect that the proposed branch by-laws, recently submitted to the membership for consideration, be adopted and the secretary was instructed to forward two copies of them to National Headquarters for approval.

Election of officers for the 1955–1956 fiscal year was held with the following officers: President, **Earl Arnold;** 1st Vice-President, **L. Truman Stoner;** 2nd Vice-President, **George Magurean;** Librarian, **Norman McEwan;** Secretary, **George Hetz;** Treasurer, **Larry O'Neal.** Board of Managers: **Stuart Krentel, Harvey Hunt, Glen Beckwith, Myron Orbaugh.** Delegates: **Truman Stoner, Glen Beckwith, Earl Arnold.** Alternate Delegates: **Jack Beall, Ken Johnson, Don Bedwell, Fred Weiss.**

NORMAN K. MCEWAN,
Secretary

LOUISVILLE

The regular monthly meeting of the Louisville branch was held January 20, at Kapfhammer's Party House, Louisville. President **J. W. Scholl** opened the business meeting with 26 members and guests present.

The membership committee reported one application for membership, **Bob Biendenbender,** c/o Globe Chemical Co., 105 N. 15th St., Louisville.

Technical sessions chairman, **S. J. Beyer** reported that **R. O. Hull,** President of the R. O. Hull Company of Rocky River, Ohio, will speak on "Methods of Testing" at the February meeting.

A letter was received from **T. K. Allison** requesting a transfer to the New York branch from the Louisville branch.

C. R. Arbegust of General Electric Company sent in his resignation from the Society, giving his reason as no longer being connected with the plating industry.

Unfinished Business: **Herb Kennedy,** of the Indianapolis branch, gave us a report of the Annual Tri-State Regional Meeting to be held Saturday, March 26, at the Hotel Deshler-Hilton in Columbus, Ohio. The afternoon session is held at 1:30 p.m. and the speakers are **Walter L. Pinner** and **Myron B. Diggin.** At 6:30 p.m. the Dinner-Dance and Enter-

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1—750 AMPERE, 60 VOLT, **HANSON-VAN WINKLE-MUNNING,** Synchronous, Exciter-in-head.
1—500 AMPERE, 25 VOLT, **CHANDEYSSON,** Synchronous, Exciter-in-head.
1—400 AMPERE, 40 VOLT, **M. G. C.,** Exciter-in-head.

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Branch News

tainment Program will begin with fine music.

New Business and Good of the Order: We had three visitors from the Yale & Towne plant in Gallatin, Tenn.: **R. L. Palmer, J. J. Gell,** and **G. Byxbee,** who were introduced by **Dick Marshall. Bill Wilson** was introduced by **Al Engle** and **George Shake** was introduced by **Bill Francis.** We welcome you, gentlemen.

A motion was made by **Stan J. Beyer** and seconded that the Louisville branch enter an exhibit in the National Convention to be held in June, 1955, in Cleveland, Ohio. President **John W. Scholl** appointed **William W. Francis** as chairman, to be assisted by Stan J. Beyer and **E. W. Eckerle.**

President J. W. Scholl turned the meeting over to educational chairman, Stanley J. Beyer, who, after a brief talk, introduced **Dr. D. Gardner Foulke** of the Hanson-Van Winkle-Munning Company, Matawan, N. J., who spoke on "Fundamentals of Electroplating." It proved to be quite a technical session. Slides were shown and narrated by Dr. Foulke. Considerable discussion followed and Dr. Foulke was given a rising vote of thanks for a very interesting talk.

J. G. Sterling,
Secretary-Treasurer

MILWAUKEE

The Annual Meeting of the Milwaukee branch will be held Saturday, April 30 at the Schroeder Hotel. The meeting will open at 9:30 A.M. and will feature a discussion of water problems in plating and allied industries. **William Neil** of the Columbus branch (Supt. Columbus Metal Products Company), who has served on the Ohio River Valley Water Sanitation Commission on Polution Problems, will be the honorary chairman. He, as first speaker, will discuss how this group is solving the problems connected with water in their area. **Theodore F. Wisniewski,** director of "Committee on Water Polution" for the state of Wisconsin, will discuss polution problems in Wisconsin and adjacent areas which are currently under study. **Dr. Tooper** of the National Aluminate Corporation of Chicago will discuss "Ion Exchange Methods for Water Treatment and Waste Disposal."

Dr. **Ralph Schaefer.** President of the AES, will discuss the affairs of the society very briefly and will deliver a paper on "A Qualitative Study of Macro and Micro Metal Distribution in Plating Baths."

The Editorial Board will hold its meeting in Milwaukee on April 29 as guests of the Milwaukee branch.

E. H. McCoy,
Publicity Chairman

NEWARK

The February meeting of the Newark branch was held at the Robert Treat.

Business matters discussed included: passage of a motion to contribute $25 to the local Red Cross agency; the election of **Salvatore Fresco** and **Paul Theussen** to membership; the acceptance of applications for membership from **John R. Fiorito,** Gem Mfg. Corp., **Salvatore A. Mollica,** Wright Aeronautical Corp., **Ray J. Litterio,** Bart Mfg. Co., **Joseph Azzolino,** Wright Aeronautical Corp., and **Edward Herzig,** Electro Tech. Corp.; and the transfer of **Austin Beebe, Jr.,** from Detroit to Newark branch.

The nominating committee, **Robert Horrocks,** chairman, **Louis Donroe** and **Howard Cobb,** presented the following slate of officers as candidates to be voted on at the March meeting: President, **Thomas Austin;** First Vice-President, **William Grigat;** Second Vice-President, **Clifford Struyk;** Secretary, **Don Foulke;** Treasurer, **George Wagner;** Librarian, **Gus Bittrich;** Sergeant-at-Arms, **Dodd Carr;** Board of Managers, **John Gumm, George Reuter, Robert Horrocks, Robert Ehrhardt.**

Bill Griget introduced **Walter Prine** who discussed the present nickel situation. He pointed out how government stockpiling cut down the amount of nickel available for industry and that distribution was made on as equitable a basis as possible. There will be considerable increase in production in the near future which should insure adequate supplies, barring a major war or a greatly accelerated stockpiling program.

C. A. Kimmel Dow Chemical Co., spoke to the sixty-three present on the finishing of magnesium, covering the requirements and methods. Important points made were: (1) Improved anodic coatings such as HAE and Dow No. 17 which are both really two-cost systems in that two types of films are laid down, one at low, the other at high voltage; (2) improved paints have been developed such as polyvinyl butyral formulations; (3) the importance of care in assembling dissimilar metals when magnesium is one of the metals and methods for overcoming this problem; and (4) increased interest in plated magnesium parts, including examples of recent applications. A number of questions attested to the general interest in the subject.

D. Gardner Foulke,
Recording Secretary

NEW HAVEN

The January 11 meeting held in the Mason Laboratory, Yale University, was called to order by President **Ed Busby**

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SITUATION WANTED—Metal Finishing Process Engineer—Interested responsible position, any or all of the following functions: process control and development, design and layout of plating plant; corrosion investigation and control. Send for resume. Reply to Box PM11, PLATING, 445 Broad St., Newark 2, N. J.

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Branch News

with approximately 40 members present.

Adam Walsh of MacDermid Sales was introduced as a new member.

Plans for the New England Regional to be held this spring in the Hotel Statler, Hartford with the Waterbury branch acting as host were discussed.

Technical chairman **Bill Bridgett** then introduced the speaker of the evening, **R. F. Ledford** of the Industrial Filter and Pump Manufacturing Company. His talk on the treatment of plating room wastes was interesting and timely and was followed by a lively question and answer period.

After the drawing for a door prize donated by Bill Bridgett of Hanson-Van Winkle-Munning Company the meeting was brought to a close.

B. J. Gaffney,
Secretary-Treasurer

PHILADELPHIA

The regular meeting was held at the Engineers' Club on February 28. Four applications for membership were received. Treasurer **Long** gave the report of the 1954 Banquet; he announced that the Benjamin Franklin Hotel had again been reserved for the 1955 affair on November 19. President **Ottens** announced a change in the date of the May meeting, Ladies Night, to the twenty-seventh, with **Ezra Blount** as speaker.

Supreme 3rd vice-president **F. Eddy's** letter regarding branch exhibits at National Conventions was read by the secretary. Discussion, with a possible stand by the branch on this question, will be held at the next meeting following receipt of branch 2nd vice-president **Farren's** report.

Librarian **Hauseman** introduced the speaker, **H. E. Head**, Chrysler Corp., whose topic was "Practical Application of Anodizing Equipment." He gave a résumé of his experiences in supervising the installation and operation of large chronic acid anodizing installations, describing equipment, solutions and operating conditions.

I. Wm. Marcovitch,
Secretary

PITTSBURGH

The February meeting of the Pittsburgh branch was held in the Avalon Room of the Sheraton Hotel.

Three new applications for membership were received from **M. F. Good, J. R. Drobne**, and **P. W. Rhodes.** We were honored to welcome two new members into our branch, **J. E. Yaeger** and **W. H. Wooster.**

During the business meeting the nominating committee proposed the following slate for next year's officers: President, **R. Schindler;** 1st Vice-President, **M. Ceresa;** 2nd Vice-President, **F. Dixon;** Secretary, **H. Schram;** Treasurer, **W. Pizoli;** Librarian, **J. Crain.** Delegates, **R. Varner, R. Schindler, M. Ceresa.** Alternate Delegates: **E. Smith, R. Goldbach, R. Woofter.**

After the buiness meeting librarian **F. Dixon** introduced our discussion panel for the evening which was composed of **Dr. A. K. Graham** of Graham, Crowley and Associates, and Dr. **H. J. Read** from Penn State. Dr. Graham presented his views on the advantage of nickel directly on steel over the copper-nickel system for bumpers. He also discussed these systems on zinc base die castings and the effect of different methods of applying the copper and nickel on corrosion resistance. Dr. Reid presented the basic theory of corrosion in neutral salt solutions as related to pitting of electroplated coatings.

After a brief pause for refreshments and the drawing for the door prize a lively discussion period followed. The door prize, a Westinghouse Automatic Cook and Fryer presented by our friends from Carmac Chemical Co. was won by **Henry J. Schaltenbrand.**

Herb Schram,
Secretary

PORTLAND

Our regular January meeting was held at Berg's Chalet with 30 members and guests present. This was our first "Ladies Nite" and we are pleased to report that several members brought their wives to the meeting. In order to pay particular attention to the distaff side, we had as our speaker, **Mrs. Faye Smith,** who showed a film, "The Romance of Silver Design." Mrs. Smith, a noted authority on silver, has spent considerable time appraising and selling silver and our branch was particularly pleased to have her as our guest speaker.

At this meeting the newly elected officers were installed.

Ken Humphrey,
Secretary-Treasurer

ROCHESTER

The January meeting of the Rochester branch was held at the 49 & 8 Club and consisted of a business and educational meeting.

A vote of thanks was given to the committee members of the Christmas party for a job well done—**Cecil Thornton, John Hourihan** and **Richard Waite.**

President **Ed Wallin** announced the appointment of **Frank Beuckman. Fred Thiem** and **Harold Baker** as the 1955 Christmas Party Committee.

Announcement of a course in plating was made. This course is to be held on Thursdays at the Rochester Institute of Technology, and is to be a lecture and discussion course. Its purpose is to pre-

Branch News

sent and analyze the principles of chemistry and electricity involved in electroplating.

The Empire State Regional Meeting is to be held at the Hotel Seneca, Rochester, on April 16, 1955. Edwin Wallin is chairman. The educational program should be very enlightening, and we promise a fine banquet and entertainment.

President Ed Wallin read a letter to the branch which he received from **Ray Berghold** in appreciation of our granting him a branch honorary membership and the gifts received. Berghold retired from his position with the Frederick Gumm Chemical Company as of January 3.

Librarian **Frank Beuckman** introduced **John Duford** who spoke briefly on Lube-Lok bonded to metal lubricating.

Our main speaker of the evening was **Al Pope,** Pennsylvania Salt Manufacturing Company, who gave an interesting talk on trouble shooting on metal cleaning.

FREDERICK L. JOHNSON,
Secretary

ROCKFORD

The regular monthly meeting of the Rochester branch was held on February 14 at the Faust Hotel. Thirty-four members and guests enjoyed a very fine dinner.

After the business session **Lawrence Ray** showed a film entitled "Zinc Base Die Castings" which was very interesting. At the conclusion of the film, Ray introduced **Merle Young** of Electric Auto Lite Co. of Woodstock, Ill., and **Richard McGuire** of the Northern Star Plating Co. of Rockford, who proceeded to answer all questions pertaining to die castings and the plating thereof.

E. J. BUDDEN,
Secretary

SAN FRANCISCO

The regular monthly meeting of the branch was held on January 13 at St. Julien Restaurant in San Francisco, with 28 members in attendance.

The principal speaker for the evening was **George Leghorn** of Western Gear Works. Leghorn gave a most informative talk on electroless nickel, pointing out the advantages and disadvantages of the process. Parts processed in this bath were passed among the members for inspection as to brightness, ductility and throwing power.

Prior to the regular speaker, a short business session was held.

The members attending voted to have every third meeting held in Redwood City in order to increase our membership on the Peninsula.

The February meeting was held at the Stone Cellar Restaurant in Menlo Park.

Our speaker for the evening was **George Reyling** of Varian Associates who spoke on the importance of cleanliness in the plating room and the methods used prior to electroplating electronic tubes parts. Reyling's speech was most interesting and informative.

Prior to the regular meeting, a short business meeting was held. **Warren Coughanour** of General Electric Company was elected to membership.

FLOYD W. BROWNING,
Secretary-Treasurer

SPRINGFIELD

We had a wonderful turnout for this meeting. Our guest speaker was **Gerry A. Lux,** Technical Educational Director of Oakite Products, Inc. He did a terrific job covering the design of electrocleaners for both ferrous and nonferrous metals; the advantages and disadvantages of cathodic and anodic electrocleaning. His talk was supplemented with demonstrations of various results. It was a real down-to-earth explanation that even a layman could grasp, without any technical knowledge.

There were 36 members and guests present.

H. L. HEISSFELD,
Secretary

SYRACUSE

The Syracuse branch held its February

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meeting at Richard's Restaurant, with 39 members present.

The speaker of the evening was **C. G. Lloyd,** Manager Broadcast Equipment, G. E. Co. His topic was colored TV, with slides and explanation on how color is reproduced for TV. A very interesting movie was also shown about the production of a colored TV program. It gave a very good picture about the tremendous amount of equipment used in a colored production.

Lloyd gave a very interesting program, which was a bit out of the ordinary for the society as far as the topic was concerned. It was highly accepted by the members.

A. G. Martineau, Jr.,
Recording Secretary

TOLEDO

A regular monthly meeting of the Toledo branch was held on January 6 at the Park Lane Hotel.

Gayle Goldsworthy was appointed chairman of the exhibits committee.

A motion was made by **Gomersall** that any prize money that might be won by a branch exhibit at the National Convention at Cleveland in June, 1955 shall be given to the person that puts the exhibit together. This motion was seconded by **Wicker** and passed.

The applications of **Julius Bach** and **Stanley Moore** were accepted.

Tom Kearney, chief engineer of the Detrex Corp., Detroit, Mich., gave a very good talk on cleaning metals with Sonic Waves.

Kermit Collon gave a demonstration by actually cleaning metal parts by sonic waves. This demonstration prompted many questions from the viewers, which were all answered by one of the company's representatives present.

Other representatives of the Detrex Corp. present were **Pane Willard,** sales manager; **Bob Deckelman,** local salesman, and **Bruce Young,** regional manager.

G. H. Bergeman,
Secretary-Treasurer

TWIN CITY

The January meeting of the Twin City branch was held at the Covered Wagon in Minneapolis with **John Sargent** of the Minnesota Mining Company as guest speaker. Sargent spoke on the new subject of fluorochemicals. This interesting talk, supplemented by movies, exposed the group to one of the most promising fields of development. The basic approach in fluorochemistry is to replace hydrogen atoms in organic compounds with fluorine. An open discussion was held following the talk with the possibilities of fluorochemicals in plating the main topic. New members added at this meeting were **Thomas J. Ballantine** and **Robert G. Smith,** both of Superior Plating Company.

WICHITA

An informative talk on the fast growing use of plastics in the plating industry was given to the Wichita branch, Wednesday evening, February 23, at our regular meeting place, the El Charro.

Hasford's descriptions and explanations for the effectiveness, as well as the difficulties, in using plastics, was very graphic. His descriptions of the simplicity of swedge welding of PVC plastic pipe gave a new note on the use of this method of joining plastic as opposed to the standard method of threading the pipe.

Tank lining with plastic is an ever-present thought in the electroplater's mind; and the description given as to methods, strengths, and weaknesses of the use of plastic liners, gave our members a much better understanding of why, when, and how they could install the liners themselves, as well as when liners would have to be purchased already installed.

The annual election of officers will be held next month at the regular meeting.

Russel H. Beatie,
Publicity Chairman

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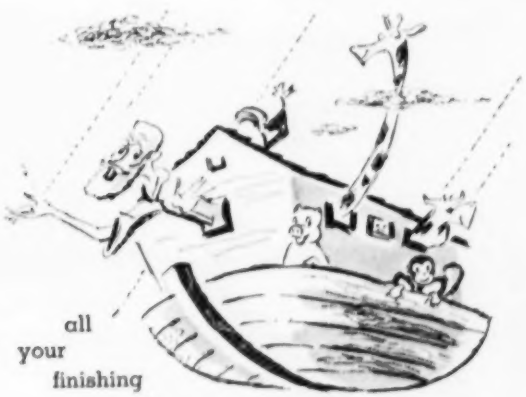

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ADELAIDE meets second Wednesday of each month. Secretary, R. J. Down, Room 30, 17 Currie Street, Adelaide, S. A., Australia.

ALLENTOWN-READING meets third Wednesday of each month in Scotty's Anchorage, Second and Main Streets, Emmaus, Pa. Secretary-treasurer, Edgar H. Iobst, Jr., 163 Main Street, Emmaus, Pa. Research finance committee chairman, Lee C. Wotring, 526 N. St. Elmo Street, Allentown, Pa.

BALTIMORE-WASHINGTON meets second Tuesday of each month with meetings in Baltimore at the Engineers' Club and in Washington, D. C., at the National Bureau of Standards. Secretary, Carl H. Thiede, 8426 Piney Branch Road, Silver Springs, Md.

BOSTON meets first Thursday of each month in Hotel Statler. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass. Research finance committee chairman, Louis V. Gagnon, 53 High Street, Natick, Mass.

BRIDGEPORT meets second Friday of each month in Barnum Hotel. Secretary-treasurer, Robert G. Parker, 25 Beverly Road, Bridgeport 58, Conn.

BUFFALO meets first Friday of each month in Markeen Hotel. Secretary, Eric G. Sampson, Jr., 43 W. Main St., Falconer, N. Y. Research finance committee chairman, Donald Rice, 235 W. Delavan Avenue, Buffalo, N. Y.

CAPITOL DISTRICT BRANCH meets first Monday of each month at Panetta's Restaurant, Menanda, N. Y., at 7:00 P.M. for dinner, educational session at 8:00 P.M. Secretary, Paul D. Callahan, 1855 Becker Street, Schenectady 7, N. Y. Research Finance committee chairman, E. Raymond, P. O. Box No. 177, Cheshire, Mass.

CENTRAL MICHIGAN meets second Tuesday of each month alternating between Meadow Lark Inn in Jackson and Porter Hotel in Lansing. Secretary-treasurer, E. J. Bosca, 411 Third Street, Jackson, Mich. Research finance committee chairman, G. S. Woodruff, 2424 Dawn Avenue, Jackson, Mich.

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CHICAGO meets second Friday of each month at 8 P.M. at Western Society of Engineers, 84 E. Randolph Street. Secretary-treasurer, Paul Glab, 882 N. Paulina Street, Chicago 22, Ill. Research finance committee chairman, Charles Geldzahler, c/o Platers' Technical Service, Inc., 509 S. Wabash Avenue, Chicago 9, Ill.

CINCINNATI meets fourth Wednesday of each month at 6:30 P.M. in Engineering Society Headquarters, McMillan Street and Woodburn Avenue. Secretary, L. J. Howald, 6265 Wiehe Road, Cincinnati 13, Ohio. Research finance committee chairman, E. Roof, 1350 Arlington Street, Cincinnati, Ohio.

CLEVELAND meets first Friday of each month in Hotel Carter at 8 P.M. Secretary-treasurer, A. J. Lupien, 4408 Carnegie Avenue, Cleveland 3, Ohio. Research finance committee chairman, to be appointed.

COLUMBUS meets first Friday of each month at 8 P.M. in Battelle Memorial Institute Auditorium. Secretary-treasurer, Michael Farr, 1735 Franklin Ave., Columbus 5, Ohio. Research finance committee chairman, to be appointed.

DALLAS-FORT WORTH meets third Wednesday of each month at 6:30 P.M. in Lennox Hotel, Grand Prairie, Texas half-way between Fort Worth and Dallas. Secretary-treasurer, research fund chairman, A. C. Fricke, 212 Julien Street, Dallas 3, Texas.

DAYTON meets third Wednesday of each month in the Biltmore. Secretary, Richard M. Clinehens, 33 W. Market St., Germantown, Ohio. Research finance committee chairman. Richard F. Moore, 526 Aberdeen Ave., Apt. B, Dayton 9, Ohio.

DETROIT meets first Friday of each month in Hotel Statler at 8 P.M. Secretary-treasurer, R. J. Racine, c/o Wyandotte Chemicals Corporation, Wyandotte, Mich. Research finance committee chairman, H. J. McAleer, 3171 Bellevue, Detroit 7, Mich.

GRAND RAPIDS meets second Friday of each month at Fingers Restaurant at 7 P.M. for dinner; educational session at 8:15 P.M. Secretary, John Dykstra, 104 Celia, S. E., Grand Rapids, Mich. Research finance committee chairman, R. O. Watson, 2206 Nelson S. E., Grand Rapids, Mich.

HAMILTON meets third Thursday of each month in the Conference Room, West End Plant, Canadian Westinghouse Company, Ltd. Secretary, R. Burke, c/o Swift Devices, 14 George Street, Hamilton, Ontario, Canada. Research finance committee chairman, W. G. Finlay, 7 Hill Street, Hamilton, Ontario, Canada.

HARTFORD meets third Monday of each month in Hotel Bond at 7:45 P.M. Secretary, Stanley Platoz, 26 Erwin Place, New Britain, Conn. Research finance committee chairman, Frank Smith, Derby Milford Road, R. F. D. No. 1, Orange, Conn.

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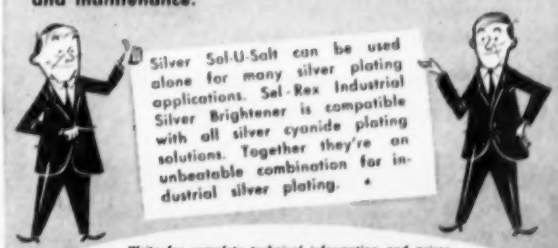
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INDIANAPOLIS meets first Wednesday of each month at Fox Steak House, 1207 E. Washington Street. Secretary, Miss Edna Rohrabaugh, 816 Robert Street, Lafayette, Ind.

JACKSON-LANSING: Name has been changed. See Central Michigan.

KANSAS CITY meets fourth Thursday of each month at Roselli's Restaurant at 6:30 P.M. Secretary, Olin K. Bock, 5317 W. 58th Street, Mission, Kans.

LANCASTER meets second Friday of each month at 8 P.M. September, December, and April meetings are held at Hanover, York, and Harrisburg, respectively; all other meetings at the Old Mill Inn, Lancaster, Pa. Secretary-treasurer, Harry A. Saylor, 40 N. Poplar Street, Elizabethtown, Pa. Research finance committee chairman, Harry Hovis, Lincoln Highway, West Lancaster, Pa.

LOS ANGELES meets second Wednesday of each month at 7 P.M. in Rodger Young Auditorium. Secretary, G. Hetz, 152 Clagstand Drive, Puente, Calif. Research finance committee chairman, Tony Stabile, 417 E. 16th Street, Los Angeles 21, Calif.

LOUISVILLE meets third Thursday of each month in Kapfhammers Party House, 1506 S. Shelby Street, Louisville, Ky. Secretary-treasurer, Joseph G. Sterling, 6025 Peggy Drive, Louisville 13, Ky. Research finance committee chairman, R. G. Marshall, 3020 Talisman Road, Louisville 5, Ky.

MELBOURNE meets third Thursday of each month at 8 P.M. in Metallurgy Theatre, Melbourne Technical College, 124 Latrobe Street. Honorary secretary-treasurer, R. W. Lennie, 433 Clarke St., Northcote, Melbourne 16, Australia.

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MONTREAL meets first Tuesday of each month in Mount Royal Hotel. Secretary, Jean Monette, 11700 Notre Dame Street East, Montreal, Canada. Research finance committee chairman, P. M. Coady, 216 Westminster Avenue, Montreal West, Montreal, Canada.

NEWARK meets third Friday of each month at 8 P.M. in Hotel Robert Treat. Dr. D. G. Foulke, Secretary, Hanson-Van Winkle-Munning Co., Matawan, N. J. Treasurer, George Wagner, Hy-Grade Electro Plating Company, 35 Fourth Street, Newark, N. J. Research finance committee chairman, John Gumm, 538 Forest Street, Kearny, N. J.

NEW HAVEN meets second Tuesday of each month at Mason Laboratory, Yale University. Secretary-Treasurer, B. J. Gaffney, 40 Filbert Street, Hamden 14, Conn. Research finance committee chairman, W. K. Murray, 48 Maple Avenue, Meridan, Conn.

NEW YORK meets second and fourth Fridays of each month in the Statler Hotel. Secretary-treasurer, George Schore, 833 Baldwin Drive, Westbury, L. I., N. Y. Research finance committee chairman, Milton Nadel, 41-15 50th Avenue, Long Island City 4, N. Y.

PHILADELPHIA meets fourth Friday of each month. Meetings are held at the Broadwood Hotel, Franklin Institute, or the Engineers' Club. Secretary, I. William Marcovitch, 1302 St. Vincent Street, Philadelphia 11, Pa. Research finance committee chairman, to be appointed.

PITTSBURGH meets first Wednesday of each month in the Avalon Room of the Sheraton Hotel. Secretary, Irvin H. Schram, Jr., 4782 Delma Drive, Pittsburgh 27, Pa. Research finance committee chairman, Myron Ceresa, 207 Highland Road, Pittsburgh 35, Pa.

PORTLAND meets second Tuesday at 5:30 P.M., in Waddles Restaurant. Secretary-treasurer, K. B. Humphrey, 2750 N. W. 31st Avenue, Portland 10, Ore.

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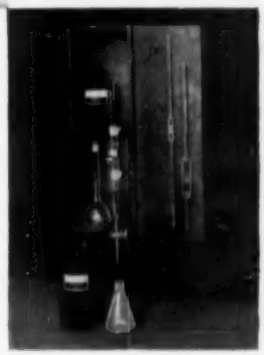

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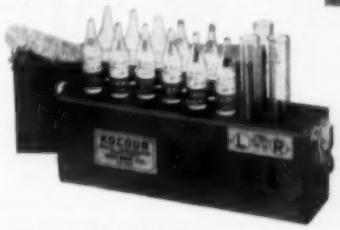

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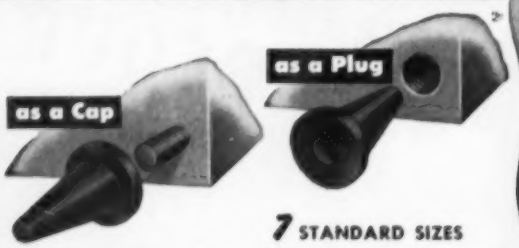

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ROCHESTER meets third Monday of each month at the 40 & 8 Club, 933 University Avenue. Secretary, Frederick Johnson, 21 Shire Oaks Drive, Pittsford, N. Y. Research finance committee chairman, Clarence VanEpps, 305 Hurstburne Road, Rochester 9, N. Y.

ROCKFORD meets second Monday of each month in Faust Hotel. Secretary-treasurer, E. J. Budden, 122 Twelfth Street, Rockford, Ill. Research finance committee chairman, David Stockton, 1511 Warren Road, Rockford, Ill.

SAGINAW VALLEY meets for dinner at 6:45 P.M. and for educational session at 8:00 P.M. at Zehnder's, Frankenmuth, Mich., second Wednesday of each month, September through May, except February. Secretary-treasurer, Dennis J. Goddeyne, 1300 N. McLellan Street, Bay City, Mich. Research finance committee chairman, A. J. Medwedeff, 2201 Bagley Street, Flint 4, Mich.

ST. JOSEPH VALLEY meets first Wednesday of each month at 8 P.M. in Elkhart Hotel, Elkhart, Ind. Secretary-treasurer, Harold J. Wiesner, 1016 Oscio Road, Elkhart, Ind. Research finance committee chairman, Adreiv Jurgensen, 119 James Street, Dowagiac, Mich.

ST. LOUIS meets second Wednesday of each month at the York Hotel, 6th and Market, St. Louis, Mo. Secretary-treasurer, E. R. Hunleth, 4415 Michigan Avenue, St. Louis, Mo. Research finance committee chairman, to be appointed.

SAN ANTONIO. Regular meeting date to be announced. Secretary-treasurer, Joseph C. Brown, c/o Friedrichs' Refrigerators, Inc., 1117 E. Commerce Street, San Antonio, Texas.

SAN FRANCISCO meets second Thursday of each month, alternating between St. Julien Restaurant, 140 Battery Street, San Francisco, and El Curtola Restaurant, 510 17th Street, Oakland. Secretary-treasurer, Floyd W. Browning, c/o L. H. Butcher Co., 15th and Vermont Streets, San Francisco, Calif. Research finance committee chairman to be appointed.

SEATTLE. Regular meeting date to be announced. Secretary, Mrs. Helen Archibald, 17560 Tenth Avenue, N. W. Seattle, Wash.

SOUTHEASTERN meets second Friday of each month at the Belmont Steak House, Atlanta, Ga. Secretary-treasurer, W. T. Weymouth, P. O. Box 246, Weaverville, N. C.

SOUTHERN TIER. Regular meeting date to be announced. Secretary, Vincent T. Maxian, 3 Wilson Street, Binghamton, N. Y.

SPRINGFIELD meets fourth Monday of each month in Blakes Restaurant, 15 Market Street, Springfield, Mass. Secretary, Henry L. Heissfeld, 74 Chilson Street, Springfield 8, Mass. Research finance committee chairman, John E. Costigan, 74 Clairmont Avenue, Longmeadow, Mass.

SYDNEY meets second Thursday of each month at 7:30 P.M. at 155 King Street, Sydney. Secretary-treasurer, J. Lean, 15 Daisy Avenue, Queenhurst, Sydney, Australia.

SYRACUSE meets third Monday of each month in Richard's Restaurant. Secretary, Lindley Wood, 1329 Bellevue Avenue, Syracuse 4, N. Y. Research finance committee chairman, K. S. Parnell, 829 Maryland Avenue, Syracuse, N. Y.

TOLEDO meets first Thursday of each month at Park Lane Hotel. Dinner 6:30 P.M.; meeting 8 P.M. Secretary-treasurer, Gaston Bergeman, 703 Pine Street, Fremont, Ohio.

TORONTO meets second Friday of each month in Royal York Hotel. Dinner 6:30 P.M.; meeting 8:30 P.M. Secretary, Robert L. Edwards, 1106 Dovercourt Road, Toronto, Ontario, Canada. Research finance committee chairman, K. Wells, 370 Victoria Avenue, Toronto, Ontario, Canada.

TWIN CITY meets first Monday of each month, October through June, in the Covered Wagon (Lodge Room), 114 S. 4th Street, Minneapolis, Minn., with dinner at 6:30 P.M. and business and technical session at 8:00 P.M. Secretary-treasurer, Robert L. Buckley, c/o Industrial Chemical and Equipment Company, 205 11th Avenue So., Minneapolis 15, Minn. Research finance committee chairman, to be appointed.

WATERBURY meets second Thursday in September thru May. Dinner 6 P.M. Business meeting 7 P.M. Technical meeting 8 P.M. Secretary-Treasurer, Spencer L. Henn, 99 Ridgeview Place, Cheshire, Connecticut. Research finance committee chairman, Ellsworth T. Candee, Beach Ave., Watertown, Conn.

WESTERN ONTARIO meets third Friday of each month in William Pitt Hotel, Chatham, Ontario. Secretary-treasurer, J. Vollans, 1262 McDougall Street, Windsor, Ontario, Canada.

WICHITA Meeting place indefinite. Secretary-treasurer, Walter Turner, 400 N. Emporia, Wichita, Kans.

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LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
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Future Meetings

Ninth Western Metal Exposition, Pan-Pacific Auditorium, and Ninth Western Metal Congress, Ambassador Hotel, Los Angeles, California, March 28–April 4, 1955.

Twin City Branch, AES, annual meeting, The Covered Wagon, Minneapolis, Minnesota, April 4, 1955.

127th Meeting, American Chemical Society, Cincinnati, Ohio, March 29–April 7, 1955.

Bridgeport Branch, AES, annual meeting, Hotel Barnum, April 8.

AES Research Committee, Hotel Seneca, Rochester, New York, April 15, 1955.

Empire State Regional Meeting, AES, Hotel Seneca, Rochester, New York, April 16, 1955.

Third National Air Pollution Symposium, Pasadena, California, April 16–19, 1955.

American Society of Mechanical Engineers, spring meeting, Baltimore, Maryland, April 18–21, 1955.

Indianapolis Branch, AES, annual meeting, Indianapolis Athletic Club, Indianapolis, Indiana, April 23, 1955.

Plating Editorial Board Meeting, Hotel Schroeder, Milwaukee, Wisconsin, April 29, 1955.

Boston Branch, AES, annual technical session and banquet, Hotel Statler, April 30, 1955.

Milwaukee Branch, AES, annual meeting, Schroeder Hotel, Milwaukee, Wisconsin, April 30, 1955.

2nd Annual Conference for Engineers & Architects, Ohio State University, Columbus, Ohio, May 6, 1955.

Toronto Branch, AES, annual meeting, Sherton-Brock Hotel, Niagara Falls, Ontario, May 7, 1955.

37th Annual Banquet and Entertainment of the Masters' Electro-Plating Association, Inc., Plaza Hotel, New York City, May 7, 1955.

16th Annual New England Regional Meeting, AES, Hotel Statler, Hartford, Connecticut, May 14, 1955.

9th General Convention of American Society for Quality Control, Hotel Statler and Hotel New Yorker, New York City, May 23–25, 1955.

42nd Annual AES Convention and 4th Industrial Finishing Exposition, Municipal Auditorium, Cleveland, Ohio, June 20–23, 1955.

ASTM 58th Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 26–July 1, 1955.

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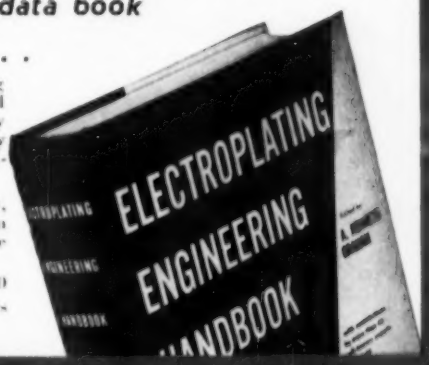

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